Intelligent Transportation Systems (ITS) (Click on section to go to article)
3.1 Systemwide ITS Deployment
3.2 Traffic/Incident Management Systems (ATMS)
3.3 Traveler Information Systems (ATIS)
3.4 Parking Guidance and Information Systems
3.5 Transportation Management Centers
3.6 Electronic Toll Collection (ETC)
3.7 Commercial Vehicle Operations (CVO)
3.8 Telematics
The “Traveler Information Showcase” was designed to demonstrate a full range of communication and information technologies applied to the needs of visitors and commuters during the 1996 Summer Olympic Games in Atlanta. Atlanta's Transportation Management Center obtained real-time data from video surveillance cameras, roadway sensors and aerial observation. The data was processed into graphic, video and text form and disseminated through cable television, hotel-based interactive television systems, on-line services, the Internet, free-standing kiosks, in-vehicle navigation devices and wireless Personal Communication Devices (PCDs). Travelers were able to request real-time information on area traffic conditions (traffic speeds and incident locations), transit schedules, parking lot locations, Olympic schedule and venues, local and wide area weather, flight schedules hotel/motel availability and area attractions.

Some of the elements of the Showcase were retained as permanent features of Atlanta's traveler information system.
More than any other metropolitan area in Europe, Stuttgart is associated with the use of advanced technology to manage its transportation system. Stuttgart's STORM project (until it was terminated in 1997 when the funds ran out) integrated through a central computer six transportation management subsystems: traffic information, in-vehicle route guidance, real-time park and ride information, traffic management, fleet management and an emergency call system. However, the legacy of Project STORM can still be found. Home and office computers and information kiosks installed at the airport, rail station and in public places throughout the city, provide access to electronic timetables for public transit, current travel times, route options and airline schedules. Prominent variable message signs mounted on main roads leading into the city center inform motorists of traffic conditions ahead, the parking situation in the city center, numbers of spaces available in the most convenient park-and-ride facility and the frequency of connecting commuter trains. This data helps city-bound motorists decide whether they should drive all the way, or leave their car at an intercept parking lot and take the train the rest of the way.

Other signs inform drivers of feeder buses of delays in the arrival of trains so that they may alter their schedules and avoid stranding passengers. Meanwhile, drivers of 100 specially equipped test vehicles are currently testing the use of on-board dual mode route guidance systems. These are fed information on recommended routes from a network of 1100 infrared beacons fixed on top of traffic lights at major intersections; and in outer areas where no beacons have been installed, they calculate route from their CD-ROM-based digital road maps. Route recommendations are revised in the light of prevailing traffic conditions by STORM computer transmitting signals through a digital Radio Data Message/Traffic Message Channel (RDS/TMC). STORM's automatic emergency call system involves a test of on-board crash sensors that trigger an automatic distress call and indicate location of the vehicle involved in an accident.


Rev. 5/99
INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS No. 3.1.3

CONCEPT: Systemwide ITS Deployment

PROJECT NAME: CityMan

LOCATION: Randstad, the Netherlands

"CityMan" is a centrally controlled regional mobility management system covering the densely developed urbanized area within the triangle formed by the cities of Rotterdam, Amsterdam and Utrecht, commonly known as the Randstad. The system utilizes an array of advanced communication and information subsystems to monitor and manage systemwide traffic flows, (CrossMan), control traffic on local roads (RoadMan), guide motorists to parking facilities (ParkMan), improve the operation of public transportation and provide dynamic information to transit riders (TravelMan) and facilitate emergency services (HelpMan).

The overall objective of CityMan is to minimize delays, smooth traffic flow, improve safety, improve on-time performance of public transit, and optimize the use of existing infrastructure, including roadways, river crossings and parking facilities.

Cooperative Mobility Program
Center for Technology, Policy and Industrial Development
Massachusetts Institute of Technology
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS  No. 3.1.4

CONCEPT: Systemwide ITS Deployment

PROJECT NAME: ROMANSE

LOCATION: Southampton, United Kingdom

Southampton, England, has become an international showcase for an integrated approach to traveler information on a regional basis. Now in its seventh year, Southampton's ROMANSE project consists of a network of closed circuit TV cameras monitoring the road system for accidents, hazards and congestion; real-time transit passenger information displays at bus stops; a system of trip planning kiosks; and a coordinated system of electronic variable message signs providing drivers with real-time information on available parking spaces, road incidents, congestion hot spots and alternate routes.

Information on parking availability at downtown parking facilities is updated at two-minute intervals. Indication of parking availability takes account of predicted travel time from the location of the sign to the parking lot. The trip-planning kiosks, installed in public places such as intermodal terminals, shopping centers and public libraries, provide up to three travel alternatives, using auto and public transit modes, with an estimated trip time for each. Riders who are visually impaired are issued hand-held devices that trigger an audio version of the “next bus” displays. The entire travel information system is available on the Internet, allowing people with computer access to obtain information about parking availability, “next bus” arrival times and trip planning assistance at home and work (http://www.romanse.org.uk).

The ROMANSE project is part of a European Union cooperative program that includes, in addition to Southampton, the cities of Cologne, Rotterdam, Strasbourg, Hamburg, Genoa and Piraeus.

Rev 5/99
INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS  No. 3.1.5

CONCEPT: Systemwide ITS Deployment

PROJECT NAME: Santa Monica Smart Corridor

LOCATION: Los Angeles CA, USA

On October 10, 1996 California state and local officials unveiled the Santa Monica "Smart Corridor" project, designed to smooth traffic flow and cut delays on one of LA's busiest and most congested freeways. The $48-million federal demonstration project uses an array of electronic devices to monitor traffic flow and detect incidents, such as pavement-imbedded loop detectors and TV cameras. When an accident or unusually heavy congestion occurs on the freeway, controllers in the command center will be able to steer motorists off the freeway onto alternate routes by means of changeable electronic message signs. Detoured drivers will be guided through parallel city streets and back to the freeway with the help of special "trailblazer" signs. Motorists will also be alerted by special AM radio channels and will be able to dial a special phone number to get the latest traffic conditions both on the freeway and on city streets.

Will commuters respond in a manner envisioned by the designers of the Smart Corridor project? Attitudinal research suggests that commuters are subject to "route choice inertia" — set patterns of travel behavior that may hamper efforts to divert traffic. Another unknown is the potential reaction (and political clout) of residents and merchants who will be disrupted by a re-routing of traffic to city streets. Evidence from other jurisdictions indicates that affected citizens offer fierce opposition to attempts to shift congestion from freeways to residential areas. On the other hand, metropolitan areas endowed with a well-developed grid of arterial roads could probably divert traffic with a minimum of opposition.

Ref: Innovation Briefs, December '96
Over the past 10 years a substantial increase in traffic congestion in Tokyo has created customer demand for timely traffic information. This demand has propelled Japan to a position of world leadership in providing traveler information services. In the Tokyo metropolitan area motorists can access not one but two systems. The first system, launched in February 1994, is operated by the for-profit ATIS Corporation, a partnership of the Tokyo Municipal Government and several private companies. The company’s traveler information center receives traffic data from various sources, merges it and sends updates to the subscribers’ terminals (personal computers, in-vehicle devices, etc) every five minutes. The service costs 3,000 yen per month ($24) and a one-time registration fee of 30,000 yen ($240). (see also 3.3.2)

The second service, VICS (Vehicle Information and Communication System) was established in July 1995 as a cooperative venture between Japan’s Ministry of Post and Telecommunications, the National Police Agency and private industry. It began operation in the Tokyo metropolitan area in April 1996. VICS is a real-time traffic management system deployed in conjunction with large market penetration of in-vehicle route navigation systems. VICS provides drivers with real-time information on traffic conditions, travel time, highway incidents, lane closure, construction updates and parking availability. It uses an FM multiplex broadcasting system and roadside microwave and infrared beacons to transmit information to motorists. The latter can superimpose traffic data on digital road maps displayed on video screens. The beacons can also provide detailed information in the form of text messages and graphics. The VICS center, launched as a public/private partnership in July 1995, began commercial operation in April 1996. Since then, VICS service coverage has expanded from its original Tokyo expressway network to the Osaka and Aichi Prefectures and the entire national expressway network. As of March 1997, some 2,600 microwave beacons and 10,000 infrared beacons have been installed along the expressway network. Sales of VICS navigation units topped 400,000 in 1996 and total nearly 2 million units throughout Japan. The chief source of revenue for VICS operation is a fee imposed on manufacturers of VICS in-vehicle devices. (see, 3.3.6)

Ref: ITS International, July/August ‘97; ITS Progress Around the World, June 1997
Eight EU cities — Barcelona, Bologna, Bristol, Dublin, Hanover, Marseille, Thessaloniki, and Trondheim — have banded together in a joint program, financed by the European Commission and coordinated by Barcelona Technologia, to demonstrate the operation of interconnected ITS applications that can contribute to increasing the use of public transport and reducing travel by private car. The pilot projects are “piggy-backing” on local initiatives, such as a U.K. national road pricing test in Bristol, EXPO2000 in Hanover and Trondheim's 1,000th birthday celebration. The pilot applications comprise the use of electronic payment, access control and dissemination of traveler information. Each city has formed a consortium consisting of city authorities, transportation service providers, suppliers and consultants. The cities of Barcelona, Bologna, Dublin and Marseille are testing the use of multiservice smart cards, (“Electronic Purse”) issued by local and national banks. The cards can be used at automated fare dispensing machines in public transit terminals, municipal parking facilities and on-street parking meters, for road toll payment and for onboard ticket validation. The cities of Trondheim and Bristol are experimenting with variable peak period congestion charges on main approaches to the city center, with Bristol applying the charges only during episodes of poor air quality. Barcelona, Bologna and Thessaloniki are experimenting with electronic access control to ensure that only authorized vehicles (i.e. delivery vehicles, residents' cars and handicapped drivers) are allowed entry into the city center during restricted hours. The purpose of access control is to reduce car traffic in the central area where parking space is very limited, and to improve the environment for pedestrians. Finally, the cities of Barcelona, Bologna, Bristol, Hanover and Marseille are demonstrating traveler information systems, integrating data from the municipality, public transport operators and highway operations centers, and using various means of information delivery, such as touchscreen kiosks, Minitel terminals (in Marseille), variable message signs. With only about half of the ITS infrastructure deployed, full results from the eight CONCERT test sites are not expected to be reported until mid-1999.

Ref: Traffic Technology Int., Aug/Sep '97
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS No. 3.1.8

CONCEPT: Systemwide ITS Deployment

PROJECT NAME: “Mobility Networks”

LOCATION: Various German regions and cities

A number of the German states (landes), e.g. Berlin/Brandenburg, North-Rhine-Westphalia, Baden-Württemberg, Bavaria and Hessen, and several cities, e.g. Stuttgart, Munich, Frankfurt and Cologne, are in the process of setting up “mobility networks,” — regional traffic information centers. All available traffic data collected by local traffic authorities, police and private traffic information services will be consolidated into a single information package. This information will then made available to broadcasters, in-vehicle information providers, transportation operators and other subscribers.

Two major German information service providers — Mannesmann Autocom GmbH and Tegaron Telematic Services GmbH (a joint venture of T-Mobil and Daimler/Benz) have formed a new company, Deutsche Daten Gesellschaft GmbH (DDG) to do the basic data collection and fusion for the Mobility Networks. Information from public sources is supplemented by data from DDG-owned sensors installed along the autobahnen.

Information will be disseminated through Radio Data System/Traffic Message Channel (RDS-TMC) and through manned call centers providing traveler information (including dynamic route guidance) on request.

Ref: Dr. Peter Zimmermann; Traffic Technology Int., Oct/Nov ’97
Four U.S. metropolitan areas -- New York, Phoenix, San Antonio and Seattle -- have been chosen to showcase deployments of intelligent transportation systems (ITS). The program, called Model Deployment Initiative, is sponsored by the U.S. Department of Transportation. It 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.

While each of the four MDI sites addresses the challenges of developing an ITS infrastructure in different ways, they all involve several common ITS components. These components are ultimately focused on the common vision of a more efficient transportation system:

- **Freeway Management** - Real-time information highlights problem areas for transportation agencies to take appropriate action (such as change signal timing or divert traffic)
- **Incident Management** - Surveillance systems help local agencies respond to incidents rapidly and effectively
- **Traffic Signal and Variable Message Sign Control** - Real-time traffic information can enhance signal timing and communication with drivers to better manage traffic flow
- **Regional Multimodal Traveler Information** - Real-time information communicated through the radio, television, telephone, the Internet and pagers enables the public to make informed travel choices
- **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 increases convenience to travelers
- **Transit Management** - Advanced vehicle location systems improve on-time performance of transit fleets and provide real-time information about bus and train arrival to waiting passengers at transit stops and terminals.

For detailed descriptions of the MDI projects see, 3.1.10 (Seattle) and 3.1.11 (New York); 3.1.12 (Phoenix) and 3.1.13 (San Antonio)
INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS

CONCEPT: Systemwide ITS Deployment

PROJECT NAME: Smart Trek

LOCATION: Seattle WA, USA

The Smart Trek Model Deployment Initiative is a partnership of the Washington State Department of Transportation, University of Washington, travel information providers, equipment manufacturers and several municipalities in the Puget Sound region which encompasses 2.5 million people. Smart Trek involves a number of interrelated services and technologies:

- A travel information web site, designed to be a one-stop information source for travelers throughout the Puget Sound area. The web site features maps indicating congestion levels and traffic speeds, real-time video images of roadways, local weather conditions, bus and ferry schedules and special incident alerts;
- *Traffic TV* – an “all traffic” cable program during morning, midday and afternoon commutes, featuring roadway speeds, estimated travel times on freeways, real-time video images and incident alerts. The program reaches 200,000 households in the Seattle area;
- *TransitWatch* – video monitors installed in transit centers and at large employment sites, displaying transit and ferry schedules;
- *BusView* – a bus tracking system that allows Internet users to check on the arrival time of their bus (see, 4.2.7);
- a parking information and guidance system at Seattle Center, a major cultural and sports facility.

Smart Trek communicates with the public using a wide array of communication technologies and devices, including broadcast radio and TV, Cable TV, the Internet, FM subcarrier transmissions, cell phones, pagers and hand-held computers, kiosks and variable message signs.


5/99
The New York/New Jersey/Connecticut region has the most complex multi-modal transportation network in the nation. More than one hundred different transportation service providers operate the region’s transportation system. Travelers are offered numerous transportation choices, but with so many systems, contacting every agency to determine schedules, routes and connections, especially when traveling in more than one jurisdiction, could be an exercise in frustration.

A Multi-Modal Traveler Information System called iTravel, currently being developed as part of the Model Deployment Initiative, will offer commuters, commercial carriers and the public real-time travel information on incidents, road conditions, highway construction and special events within the entire region. To implement iTravel, TRANSCOM — the 15-member transportation coalition in the New York/New Jersey/Connecticut region — has partnered with private firms and the New York State Department of Transportation. iTravel will be operated and maintained by the private sector, and the revenues generated by the program must cover operating expenses.

Beginning in mid-1999, iTravel will offer three separate traveler information services. Two of them will provide planned and real-time transit and traffic information free of charge via the telephone and the Internet. A Traveler Information Center will combine data for the entire region, building on the existing regional multimodal database maintained by TRANSOM. TRANSCOM runs a 24-hour, 7-day joint communications center in Jersey City, NJ, and an information sharing service for more than 100 public agencies in the New York/New Jersey/Connecticut region. The iTravel Information Center will be operated by a private partner. A Transit Itinerary Planning System (TRIPS) — the second service — will allow the public to create customized travel plans, based on their personal travel preferences.

The third service, Personalized Traveler Services (PTS), will be a subscription-based service that will notify individual subscribers in real-time of transportation alerts affecting their selected route and time of travel. PTS is event driven, providing notification to individuals only when an incident occurs on the subscriber's registered route. They may receive PTS alerts through a variety of means, such as e-mail, fax, pager, cell phone, or palmtop computer.

AZTech is a partnership of the Arizona Department of Transportation (ADOT), Maricopa County DOT, Municipalities and private industry to apply ITS technologies in an integrated manner to ease congestion, reduce delays, improve public transportation and provide real-time traveler information. The AZTech system, one of four U.S. ITS Model Deployment Initiatives, comprises the following:

- Thirteen multimodal traffic control centers are linked through a fiberoptic telecommunications network to monitor traffic conditions, coordinate traffic signals and respond to emergencies. When accidents occur, traffic centers alert drivers, notify emergency response teams and divert traffic to other routes.
- ADOT’s freeway and “smart corridor” (arterial) traffic management systems use cameras, traffic sensors, synchronized traffic signals and variable message signs to monitor traffic conditions, manage traffic flow and warn motorists of delays.
- AZTech has installed GPS-based automatic vehicle locators (AVL) on the public bus fleet to track the buses along their routes and keep them on schedule. Electronic message signs and kiosks at transit centers tell passengers when their bus will arrive based on prevailing traffic conditions.
- A regional traveler information system provides up-to-the-minute information on traffic conditions throughout the region. Kiosks provide traffic updates and tourist information at shopping malls and business centers. Travelers can check current traffic conditions on the Internet and on cable television during “drive-time” hours. Personalized traffic reports via e-mail and mobile phones warn drivers of traffic incidents along their commute. Real-time traffic conditions and turn-by-turn navigation assistance can be provided via hand-held computers.

Ref: Traffic Technology Int., Annual Review ’99

5/99
CONCEPT: Systemwide ITS Deployment

PROJECT NAME: TransGuide

LOCATION: San Antonio TX, USA

This Model Deployment Initiative, was launched in July 1995 as a partnership of the Texas Department of Transportation, the City of San Antonio and VIA Metropolitan Transit. The system is deployed over 26 miles of highway and will eventually cover 191 miles of state highway. TransGuide utilizes fiber optics, loop detectors and video cameras to detect changes in traffic flow and alert operators in the TransGuide operation center. In addition, the TransGuide system, one of four U.S. ITS Model Deployment Initiatives, comprises the following:

- Sensor tags placed in selected probe vehicles transmit a signal to antennas placed along highways and allow TransGuide to determine average travel speeds along the instrumented segments of the roadway;
- An Emergency Medical Services (EMS) Management System (LifeLink) permits two-way video teleconferencing between emergency medical personnel in a hospital and paramedics in an ambulance en route to the hospital. LifeLink transfers vital data from the ambulance to the hospital. Trauma center physicians are able to determine the type of injuries involved and route patients to the appropriate medical facility;
- Forty interactive traveler information kiosks are placed at key tourist locations throughout the city as part of the Traveler Information program. Tourists and visitors can access real-time traffic information, average highway travel speeds, bus and airline schedules, weather reports and points of interest. Information is updated every hour;
- Cameras located inside transit buses allow personnel in the TransGuide operations center to monitor security inside the vehicles when the driver hits the “panic button”;
- In-vehicle navigation units provide drivers with real-time traffic conditions and incident information, and transmit vehicle position and route guidance over an FM subcarrier, using a map-and-guide display and voice prompting.


5/99
Since 1989 Melbourne's freeways have been equipped with an electronic congestion and incident detection system (ACIDS) utilizing detection loops at approximately 500 meter intervals. The loops send signals every 20 seconds to a traffic control center indicating speed, volume and lane occupancy data. Should the rate of change be significant over several consecutive intervals, an alarm is sounded in the traffic control center. Once the central computer raises an incident alarm, operators view the incident by video surveillance and take appropriate action to inform the motorists of the congestion ahead and dispatch an incident-clearing team.

*Drive Time*, an extension of the incident detection system, utilizes the same detection loops to calculate travel time for each 500-meter section of the road. Times in adjacent segments are totalled and converted to times between freeway exits. The information is presented on electronic variable message boards, showing estimated travel times from the sign location to various freeway exits. A color-coded strip shows traffic conditions on segments between each major exit. Other variable message signs at freeway entry ramps alert drivers of traffic conditions on the freeway, giving them an opportunity not to enter the freeway (or exit the freeway) if conditions ahead are "red."

Information about travel times between specific freeway exists, and about incidents is also made available over the telephone.
France possesses one of the most extensive traveler information networks in the world. Currently, five radio stations broadcast on a single frequency (107.7 FM) and cover more than 2,400 km of autoroutes. Radio coverage will be extended to 4,500 km beginning in 1997. Regional traffic management centers collect data on traffic conditions utilizing police patrols, loop detectors, TV cameras and aerial surveillance. This information is processed and broadcast to motorists 24 hours a day. Motorists can receive traffic information relative to their own sector (100-200 km radius) as well as for the entire national autoroute system. RDS (Radio Data System) technology permits transmission of urgent traffic bulletins (e.g. "MAJOR ACCIDENT AHEAD") to motorists by automatically turning on the car radio or overriding another frequency the motorists might be tuned to.
Barely six months after it was formed in February 1994, Japan's Advanced Traffic Information Service (ATIS) Corporation has become a major supplier of traveler information in the Tokyo metropolitan region. Formed as a joint venture between the city of Tokyo and private sector interests, ATIS began to provide real-time information on traffic congestion, travel time, parking lot availability, traffic flow restrictions and incidents 24 hours around the clock. The company plans to add event, weather and intermodal information in the near future. Information is transmitted over telephone wires, cellular phones and cable to personal computers and television monitors in homes, offices and in-vehicle displays. The service via telephone line costs 2,000 yen ($20) per month, with a one-time registration fee of 15,000 yen ($150). Special service, using dedicated line, costs $200 per month, with a registration fee of $800.

The decision to go commercial was based on wide public acceptance of intelligent systems technology by Japanese motorists. According to Japanese transportation officials, the ATIS service has outpaced radio stations and variable message signs in providing information to motorists (see also 3.1.6)

Ref: ITS Progress Around the World, June 1997
CONCEPT: Traveler Information Systems

PROJECT NAME: Chrysler Tech Center *Fast Trac TV*

LOCATION: Chrysler Tech Center, Auburn Hills MI, USA

*Fast-Trac* is the name given to a system of advanced traffic management technologies deployed by the Road Commission of Oakland County, Michigan. The system employs inductive loop sensors, TV monitors, autoscope cameras and roadside beacons to detect vehicles and measure traffic flow. This data is transmitted to a Traffic Operations Center (TOC), where a central computer automatically adjusts traffic signals throughout the network to optimize traffic flow and minimize delays at intersections. The data also provides a foundation for a traveler information system that can be used to alert motorists of traffic bottlenecks and major highway incidents. The Traffic Operations Center's computer generates color-coded maps, known as *Fast-Trac TV*, that depict in real time the state of congestion on Oakland County's streets. By the end of the year, Fast-Trac TV will be able to depict real-time traffic conditions on Oakland County's entire arterial-freeway network.

By an arrangement between the Road Commission and Chrysler Corporation, *Fast Trac-TV* is provided to the 10,000 employees at the Chrysler Technology Center (CTC) in Auburn Hills. The signal is transmitted by a modem to the Tech Center and then, using specially developed software, converted and disseminated over CTC's internal cable network to the more than 500 TV monitors located throughout the giant CTC facility. Maps are updated continuously, providing departing employees with up-to-the-minute reports on traffic conditions throughout the region and allowing them to determine the best route home — or postpone their time of departure in case of a major incident. The computer-generated congestion maps are supplemented by text messages alerting home-bound employees to major incidents, road closures, construction detours and hazardous road conditions. Eventually, this information may also be accessible through employees' desk-top computers, and may include an icon that automatically alerts users of unusual traffic conditions (incident, road closure, high level of congestion) along their customary itinerary which has been programmed into their individual computers.

*Ref: Innovation Briefs, Jan/Feb ‘97*
As the use of the Internet grows in popularity, real time travel information is increasingly being offered on the World Wide Web (WWW). Since 1996, transportation Web pages, set up by state and local transportation agencies have proliferated throughout the world. As more and more people gain access to the Internet through personal computers at work, at home, in schools and libraries, timely information about traffic conditions will become readily accessible to a large segment of the traveling public.

An outstanding example of the use of the Internet to communicate traveler information is Riderlink, a joint venture of King County Metro Transit and the Overlake Transportation Management Association, an organization of eight suburban employers (including Microsoft and Nintendo) in the Seattle area. Riderlink, in operation since December 1994, provides employees of member companies and anyone else with access to the Internet, with information about a broad range of travel options: bus routes and schedules, ridesharing services and ridematching assistance, ferry schedules, biking information, as well as real-time freeway congestion updates and road construction reports generated by the Washington State Department of Transportation.

WWW traveler information sites can also be found in many other metropolitan areas in the United States and Europe. The Web sites often provide color-coded maps depicting traffic conditions on the area's freeways. Several Web sites offer static video images of freeway traffic from fixed television monitors. Others provide transit schedules and information about other travel alternatives.
The project involved deployment of over 160 traveler information kiosks in Atlanta and across the state of Georgia, in time for the 1996 Summer Olympic Games. The kiosks, which have been retained after the Olympics, provide information to aid both daily commuters in the metro Atlanta area and visitors throughout the state. Travelers are able to access traffic conditions, public transit schedules, airport schedules and tourist services information through the kiosks' touch screen interface. Real time traffic conditions are displayed on a color-coded map of the Atlanta region. Travelers are able to choose from a list of origins and destinations or enter specific addresses for routing. Real time traffic conditions are taken into account when calculating the best route.

Public transit information, including schedules and itinerary planning, is available through an interface with the Metropolitan Atlanta Rapid Transit Authority (MARTA). Information about ridesharing, vanpooling and park-and-ride options is part of the kiosk program through the Atlanta Regional Commission's Commute Connections program. The kiosk information menu also includes current weather forecasts (available as text or in graphics form), airline arrival and departure schedules for Atlanta Hartsfield Airport, and tourist attractions, lodging information and a hotel reservations system. Every kiosk is equipped with a touch screen interface, an on-screen keyboard and a laser printer, all enclosed in a free-standing structure. Kiosks are located both indoors and outdoors, at public and private sites. The entire kiosk system is maintained by GeorgiaNet, an authority charged with marketing and selling electronic access to public information to public and private customers.
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS No. 3.3.6

CONCEPT: Traveler Information Systems

PROJECT NAME: VICS (Vehicle Information and Communication System)

LOCATION: Japan

VICS (Vehicle Information and Communication System) was established in July 1995 as a cooperative venture between Japan’s Ministry of Post and Telecommunications, the National Police Agency and private industry. It began operation in the Tokyo metropolitan area in April 1996. Since then, the VICS service has been expanded to the Osaka and Aichi Prefectures and all expressways in the nation. VICS provides real-time information on traffic congestion, accidents, travel time and parking availability using an FM multiplex broadcasting system (for wide-range distribution) and roadside microwave and infrared beacons. As of March 1996, more than 12,600 beacons have been installed in several cities and on the intercity expressway network. Full national coverage is expected by year 2000.

VICS is a non-profit venture and disseminates all information free of charge. It partly recovers its operating expenses from a fee imposed on manufacturers of VICS in-vehicle equipment. To date, approximately 250,000 units have been sold at a cost of $500 per unit. (See, also 3.1.6)

INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS  No. 3.3.8

CONCEPT: Traveler Information Systems

PROJECT NAME: Intranet

LOCATION:

Providing workers with timely and accurate travel-related information in the workplace has been one of the objectives of ITS deployment. Arming employees with reliable information about the state of the roads may help them choose the least congested route home and the best time of departure. But giving employees convenient access to such information is easier said than done. While traffic advisories are readily obtainable on afternoon news broadcasts, most employees do not have radios in their offices. Similarly, company policies often prohibit workers from accessing the Internet, another rich source of traffic information.

Enter the Intranet. In most large companies employees already are connected electronically via a Local Area Network (LAN). A LAN links dozens or even hundreds of desktop computers in an internal network so employees can communicate with one another, share information, and access common databases. The Intranet, using LAN infrastructure already in place, and employing the same standards and protocols as its more famous cousin, the Internet, is the internal version of the World Wide Web. But, whereas the Internet comprises an open network of Web sites which any one with a computer is free to access and download, the Intranet is a network turned inward, designed for the exclusive use of the company's employees, and protected from the outside world by an electronic firewall. Intranets are used for a variety of corporate purposes. Their web sites contain corporate databases, announcements (electronic bulletin boards), manuals, company policies & procedures, directories, schedules and internal correspondence. The use of Intranets is limited only by the needs and imagination of their corporate sponsors. One of the more inventive uses of the Intranet is the communication of real time traffic information. A pioneering example of it is the Fast-Trac TV system deployed at the vast Chrysler Technology Center in Auburn Hills, Michigan (see, 3.3.3)

Cooperative Mobility Program
Center for Technology, Policy and Industrial Development
Massachusetts Institute of Technology
A novel traveler information concept, the Traveler Information Radio Network (TIRN), has been launched on an experimental basis in Florida. TIRN is a statewide radio advisory program for intercity highway travelers, broadcasting continuously over a 19-station commercial AM radio network throughout the state of Florida. The service is a commercial venture, operated in partnership with the Florida Department of Transportation (FDOT). The TIRN format, patterned after the CNN Headline News Network, consists of continuously updated segments of traffic, weather and tourism information, interspersed with traveler-oriented commercials advertising roadside services, lodging, restaurants and tourist attractions. By contract with FDOT, one minute of each ten-minute segment is set aside for official public service announcements on topics from seat-belt use to drunken driving risks. FDOT can also completely preempt normal programing in case of a major accident, natural disaster (such as a hurricane) and other local or statewide emergencies.

The 19 stations forming the TIRN network have been recruited from among existing independent AM radio stations. The selected stations must commit to converting to the TIRN format exclusively. That format calls for four minutes of local information and six minutes of statewide information (e.g. major tourist attractions, places of historic significance) in each 10-minute period. Two minutes of each ten-minute block of time are devoted to network-wide advertising and two minutes to local advertising. Revenue from network advertising will go toward recovering the private sponsors’ investment, while local advertising revenue will be kept by the affiliate stations.

As part of the agreement, the Florida Department of Transportation has allowed TIRN to erect, at its own expense, up to 4,600 motorist information signs on the public highway right-of-way announcing the radio frequency of the local TIRN station affiliate. The large blue-and-white signs are placed at all entrances to Florida's limited access highways. Other signs, erected along the roadway, remind motorists to change radio frequencies as they cross from one affiliate's listening area to another. For long distance travelers, the “pass off” from one station to another will occur approximately every 20 minutes of highway driving.

Rev. 5/99
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS  
CONCEPT: Traveler Information Systems

PROJECT NAME: Traffic Message Channel (RDS-TMC)

LOCATION: Germany, France, Spain, Sweden, United Kingdom, the Netherlands

Radio data systems (RDS) employ an FM subcarrier to transmit a steady stream of timely traffic bulletins over a special Traffic Message Channel. Known in Europe by its acronym as “RDS-TMC”, the Traffic Message Channel alerts motorists about major incidents and road hazards, overriding, if necessary, on-going music and entertainment programs or even “waking up” the receiver to deliver the announcements. The RDS signals are beamed in the form of “event codes” and “location codes” over a digital data sideband of regular FM radio broadcasts. The event codes cover all possible traffic incidents and hazardous conditions (there are 3,100 agreed event codes in the European RDS-TMC protocol), while the location codes pinpoint the location of incidents. When the coded signals reach the decoder-equipped RDS car radio, they are automatically translated into traffic messages. The messages are delivered in synthesized voice and/or textual form in the listener’s own language, so that drivers can understand traffic announcements no matter in what country they may find themselves driving.

The key benefit of RDS technology over conventional car radio is that RDS receivers can filter out all extraneous messages that do not pertain to the traveler’s own route by recognizing only location codes programed in advance into the receiver. Thus, drivers can be listening to other programs without being interrupted by announcements of traffic problems that do not concern them. Conversely, they are kept informed of problems affecting their own route even if they happen not to be listening to the radio, because RDS signals can “wake up” a dormant RDS radio receiver. The fact that motorists can receive emergency messages in their preferred language is another unique and highly valued feature on a continent where motorists speak many different languages.

All told, 11 European countries have committed to launching RDS-TMC service over the next two years, using a common protocol for the coded message format, known as Alert-C. For the time being, RDS-TMC services will be country-specific, i.e., each country will operate its own national traffic data system and determine the content and quality of the information provided over the Traffic Message Channel. Eventually, however, all individual national systems will be fused into a single, continent-wide information diffusion network, with traffic data exchanged across national borders. Motorists will be able to use their RDS radios in any country and receive uniform quality of data in their chosen language. Such, at least, is the vision and the hope of the European Commission which has been on the forefront of RDS-TMC development and a strong champion of a unified pan-European RDS-TMC system.

Ref: Innovation Briefs, Sep/Oct ‘98
Rev. 5/99

Cooperative Mobility Program
Center for Technology, Policy and Industrial Development
Massachusetts Institute of Technology
**INTERNATIONAL MOBILITY OBSERVATORY**  
**INNOVATION FACT SHEET**

<table>
<thead>
<tr>
<th>STRATEGY:</th>
<th>INTELLIGENT TRANSPORTATION SYSTEMS</th>
<th>No. 3.3.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCEPT:</td>
<td>Traveler Information Systems</td>
<td></td>
</tr>
<tr>
<td>PROJECT NAME:</td>
<td>Visionaute</td>
<td></td>
</tr>
<tr>
<td>LOCATION:</td>
<td>Paris Region, France</td>
<td></td>
</tr>
</tbody>
</table>

Visionaute is the name given to a new traveler information service launched by "Mediamobile" a joint public-private venture of Télédiffusion de France (the French national broadcasting organization), Renault and Cofiroute, France's largest toll road operator. The service will be initially available only in the Paris region. Eventually, Visionaute service will be expanded to every major French city and possibly to other European countries.

The traffic information is broadcast through an encrypted RDS-TMC channel. A special in-vehicle RDS-TMC (Radio Data System-Traffic Message Channel) receiver is necessary to access the service. Two types of receivers are available. One type is integrated into the dashboard, while the other is a portable unit. The former has a color display and GPS location capability and sells for approximately $1,300. The portable version, costing approximately $500, can be obtained in retail outlets selling auto parts.

The Visionaute service is offered by subscription, at a monthly fee of approximately $20. Subscribers to the Visionaute have a choice of travel routes between 200 major origins and destinations within the Paris region. For each origin-destination alternative, users will be able to obtain directions for the most direct and the quickest route, together with the estimated travel time and alerts concerning incidents along the chosen route. Subscribers will be able to store oft-traveled, user-defined routes in the Visionaute’s memory for quick retrieval. Mediamobile estimates it will have 30,000 paying customers in the Paris region by the end of 1999.


Cooperative Mobility Program  
Center for Technology, Policy and Industrial Development  
Massachusetts Institute of Technology
The British system, known as Trafficmaster, first introduced in 1988, currently covers all British motorways and some 500 miles of trunk roads. It monitors the average speed of traffic with the help of infrared sensors that detect changes in the speed of vehicles passing beneath sensors mounted overhead on motorway bridges and overpasses. More recently, the company has introduced a new technology of detection that involves the use of infrared cameras. The cameras, located every four miles, automatically record the license plates of passing vehicles and transmit the data by radio link every four minutes to Trafficmaster’s computer located at its national data center in Milton Keynes. The computer matches up the “sightings” of a sample number of vehicles from consecutive cameras and calculates the average speed of traffic on each four-mile segment. The data is broadcast in encrypted form to Trafficmaster’s subscribers and displayed visually on small receivers mounted on the dashboard.

Nearly 120,000 receiver units are currently in use. More than 80,000 units were sold in 1996 and 30,000 units were sold in the first quarter of 1997, leading the company to forecast that subscribers will reach 300,000 by the end of 1998. Trafficmaster has also targeted its services at cellular telephone users. A special receiver, code-named “Trafficmaster Companion,” alerts cellular telephone users of the existence of motorway congestion in their locality. Detailed information concerning the extent of the congestion, its exact location and its impact on travel time, is obtained by calling a special access number. Trafficmaster also supplies traffic and traveler information to Capital Radio — a commercial radio broadcasting chain representing 15 percent of U.K.’s commercial radio market.

Finally, the company is working with the European motor vehicle industry on the next generation of information systems known as “Trafficmaster Oracle.” These units will be integrated into car RDS (radio-data system) radios, so that driver information bulletins will automatically override other radio signals. Vauxhall Motors has announced plans to provide the receivers as a standard feature in its 1999 models and several other companies have indicated an intention to install the unit as an option in certain 1999 models.

Ref: Innovation Briefs, Sep/Oct 1997
CONCEPT: Traveler Information Systems

PROJECT NAME: Trafficview/Sidewalk

LOCATION: Seattle, plus nine other US cities

“Sidewalk” is the name given to a Microsoft-sponsored web site, whose purpose is to serve as a comprehensive city guide for visitors and residents. Unlike a conventional guide, “Sidewalk” provides more than just listings. It is a veritable on-line city magazine covering all worthwhile happenings, from the opening of a new art show to the launching of a new restaurant and the latest film showings. Originally available only in Seattle, Sidewalk is now offered in ten cities.

Trafficview is “Sidewalk’s” traveler information service. It lets the viewer monitor current traffic conditions with the help of a color-coded congestion map and video images from surveillance cameras. By pointing a cursor to a particular road segment, the viewer can obtain an estimated speed of traffic for that segment. By clicking on an icon, the viewer can call up a snapshot of traffic at that location. Trafficview obtains raw data from local transportation agencies but offers several unique features that are not available on public agency web sites. For example, by clicking on an origin and destination of the Trafficview map, the viewer can obtain an estimate of the freeway driving time between the two points. The system also provides personalized commute reports and, upon request, sends a daily e-mail message with estimated trip time.

“Sidewalk” generates revenue by selling local and national advertisements. According to a Microsoft spokesman, Trafficview would not be commercially viable as a stand alone service, but it complements nicely “Sidewalk’s” purpose, which is to help people make entertainment decisions. It is a concrete illustration where “bundling” traveler information with other information adds value to the total package of services.
<table>
<thead>
<tr>
<th><strong>Strategy:</strong></th>
<th><strong>Intelligent Transportation Systems</strong></th>
<th><strong>No. 3.4.1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concept:</strong></td>
<td>Parking Guidance and Information Systems</td>
<td></td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>Various cities in Europe</td>
<td></td>
</tr>
</tbody>
</table>

The objective of advanced parking management systems is to provide motorists with accurate, continuously updated information about the occupancy status of parking facilities, so as to allow motorists to select in advance the most convenient parking location. Parking guidance systems may be used to facilitate access to parking garages in central business districts, surface parking lots on the periphery of downtown areas, park-and-ride lots serving suburban commuter rail stations, satellite parking lots at airports, and parking areas surrounding sports and entertainment complexes.

Typically, on approaching their destination (a city center, an airport, a sports arena, etc) motorists encounter a tier of variable message signs mounted on a single pole, showing a continuously updated inventory of available parking spaces at all parking facilities. The signposts indicate the number of available spaces in each parking facility, thus sparing motorists the inconvenience, loss of time and frustration of a blind and fruitless search for parking.

The architecture of APMS is fairly straightforward. Individual parking facilities are equipped with "add-and-subtract" loop detectors which record the exact number of spaces left vacant. This data is transmitted to a central computer which interprets and displays the information on variable message signs erected at strategic locations on approaches to the area.

Electronic parking guidance systems are already functioning in many European cities, where severe congestion and shortage of space in city centers have provided a strong incentive for their deployment.

*Ref: Innovation Briefs, December ’95*
The Parking Guidance and Information System (PGI) in Nottingham utilizes the facilities of two local radio stations to inform visitors and shoppers about parking availability in city center. The system is particularly needed during the pre-Christmas period when Nottingham experiences a substantial increase in shoppers, which leads to overcapacity at the city's parking garages.

The parking information bulletins are broadcast three times an hour and cover:

- A list of parking garages which are full and estimated waiting time to obtain a parking space
- A list of garages with spaces available
- The current status of park-and-ride lots on the periphery of the city

The PGI system has been found to reduce parking search time and motorist frustration. Recent studies have found that the time spent in searching for a parking space can constitute up to 25 percent of the average total travel time to Nottingham's central business district.

The ROMANSE project in Southampton has been using a similar system since May 1992. The system monitors how many vehicles are using the city's 13 main parking lots and garages, and displays how many spaces are available in each of them on eight electronic parking information signs located on roads leading into the center of Southampton. The information is updated every two minutes.
Strategic mobility innovation: Parking Guidance and Information Systems

Project name: Airport Garage

Location: Houston Intercontinental Airport

Going up and down ramps frantically searching for a parking space as the flight time draws near is a thing of the past at the Houston Intercontinental Airport. The new garage is equipped with a computer-controlled system that uses inductive loop sensors embedded in the garage floor to count cars entering and exiting each of the 12 parking sectors in the 6,500-space facility. The computer than guides drivers to open sectors with vacant spaces. The system controls 19 entry gates, monitors 22 exit gates and operates 47 electronic signs to provide passengers with real-time information on the location of vacant spaces.

Certain European garages go one step further. Each parking stall has an overhead red and green light visible from afar. As a car leaves a stall, the red light changes to green. Arriving motorists know immediately the location of unoccupied spaces as they enter a floor.
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS   No. 3.4.6
CONCEPT: Parking Guidance and Information Systems
PROJECT NAME: Cologne ParkInfo
LOCATION: Cologne, Germany

Using the Internet, radio, on-board navigation system or mobile phone, drivers can access information about the number of available parking spaces in Cologne's city center parking garages, thus cutting out unnecessary searches and driving around. Information on available parking space is transmitted continuously from 7 public parking garages to Cologne's traffic control center. NetCologne, the city's central data dissemination system, makes the information available to Cellway, Cologne's mobile phone service provider; WDR, the region's main broadcasting station; and Cologne's Internet website. Cellway, in turn transmits the parking space data to the local operator of an in-vehicle navigation system.

The parking information system, known as Cologne ParkInfo, is a joint venture of the automakers BMW and Ford, the city of Cologne, Siemens, the Technical University of Aachen and the telecommunication service providers, NetCologne and Cellway. BMW and Ford cars have been equipped with in-vehicle receivers for on-board reception of ParkInfo data during this four-month trial. The effects of ParkInfo on city center traffic will be evaluated by researchers from the Technical University of Aachen.

CONCEPT: Parking Guidance and Information Systems

LOCATION: Ghent, Belgium

The city of Ghent has a municipal network of nine multi-level parking garages located in the city's central area. In order to use the available parking capacity efficiently and distribute the parking demand evenly among the different facilities, the city has established a comprehensive parking information system that employs variable message signs and cable TV to guide motorists to vacant parking spaces.

Data about the changing vacancy status of each parking facility flows continuously to a central computer which transmits the information in real time to a series of variable message signs located on each of the 18 main access roads to the city center. The signs display the number of free parking spaces in each parking garage. When 95 percent of the parking capacity of a garage is occupied, the sign changes to “full” Signals to the variable message signs are transmitted over the city's cable TV network.

A special “P route,” forming a mini rung around the center, connects all parking garages to each other. On approaching the city center, a motorist consults one of the variable message signs that tells him which garages still have unoccupied parking spaces. Once on the circular P route, he follows static color-coded signs to the parking garage of his choice.
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS

CONCEPT: Transportation Management Centers

PROJECT NAME: Traffic Control Center

LOCATION: Tokyo, Japan

What may be the most elaborate Traffic Management Center in the world is located in Tokyo. The Tokyo Traffic Control Center, which the Study Team visited during its tour of the city, controls about 7,000 traffic signals on-line (out of a total of 14,000 signals in the Tokyo metropolitan area). The Center's computer controls the timing of green lights to maximize traffic capacity and alleviate congestion by estimating traffic demands. Preference control over conflicting traffic flow and inflow control to the congested area are also applied.

The traffic control center provides motorists with information on congestion, travel times between originating points and destinations, traffic regulation and parking availability through radio broadcasts, variable message signs, fax and call-in telephone service. Center personnel monitors traffic situation 24 hours with the help of a battery of television monitors. The monitors show traffic on arterials and freeways throughout the vast metropolitan area. Center operators can override the computer to trigger traffic control functions and provide traffic information from the consoles on their desks. Each console is equipped with a database showing past and present traffic patterns on a map, graphs and charts, and can communicate with safety, transportation and police organizations through telephone and wireless radio. The system includes some 120 computers on a local area network connected with high speed fiber optical cables.

Ref: ITS Progress Around the World, June 1997
CHART (Chesapeake Highway Advisories Routing System), a joint effort of the Maryland Department of Transportation and the Maryland State Police, operates the only statewide transportation management center. Its mission is to monitor and manage the entire statewide highway network. CHART is comprised of four basic components: (1) surveillance - detection of what is happening at every moment on all major parts of the highway system; (2) incident response - working with police, fire and other emergency response agencies to clear up accidents as quickly as possible; (3) traveler information - alerting users to unusual problems that are disrupting traffic flow; and (4) traffic management - managing traffic flow through signs, signals and other traffic control measures.

CHART activities are coordinated from a Statewide Operations Center. Local traffic operations centers operate in several locations to handle local area needs during periods of high traffic. In off-peak periods coverage is provided from the centrally located Statewide Operations Center. A seasonal Traffic Operations Center for beach-bound recreational traffic operates during the summer months.

Ref: Traffic Technology International, Summer ‘95, p. 14
The Houston Intelligent Transportation System consists of an array of information gathering, processing, and communications technologies bundled together to manage the region’s traffic and transportation. The system gathers information on the volume and speed of traffic flow, incidents and accidents, construction detours, weather and pavement conditions, transit schedules, transit service disruptions, and other relevant information about the travel environment in the metropolitan region. The data is obtained from sensors embedded in highways, automatic vehicle identification (AVI) systems, computerized traffic signals, closed circuit television cameras, as well as through radio and cellular telephone reports. All this information flows into Houston's Transportation and Emergency Management Center — the "brain" of the system, where the data is processed, interpreted and disseminated. TRANSTAR puts that information into the hands of users through a variety of communication media: radio, cable and commercial television, office and home computers, in-vehicle displays, changeable message signs and kiosks with interactive video terminals. Potential users include commuters at home, at work and in their cars; commercial fleet operators such as delivery services and taxicab companies; and police, fire and ambulance personnel. What makes the system effective is the immediacy and speed with which information is gathered, processed, disseminated and acted upon.

Unlike most other cities' traffic control facilities, TRANSTAR combines personnel and operations from state, county and city government and the transit authority under one management structure. By minimizing administrative and jurisdictional boundaries the center is able to respond to its multiple missions in a much more effective manner.

Ref: Innovation Briefs, June '94
A car passes through a toll plaza without coming to a stop. The tag installed on the windshield communicates with a computer located at the toll booth. The roadside computer identifies the vehicle and debits the amount of the toll from the balance stored in the tag. The long lines of cars waiting to pay tolls have disappeared. The toll agency's revenue collection process is more efficient and more secure. The agency can now try more experimental pricing policies, such as time-of-day variable tolls.

This scenario is being replicated with increasing frequency on toll roads around the world. In the United States, ETC systems have been introduced by toll agencies in Atlanta, Dallas, Denver, Houston, Miami, New Orleans, New York, New Jersey and Oklahoma. ETC systems also operate in France, Germany, Great Britain, Italy, Japan, Norway, Sweden and Switzerland.

Automatic Vehicle Identification (AVI) is the technology that makes ETC systems possible. AVI works by means of wireless communication between a transponder mounted on the vehicle (usually on the windshield) and a sensor located at the roadside. Sensors can read information about the tag while the vehicle is moving. Early versions of these systems could communicate only one way: they could "read" the data stored in a tag mounted on the vehicle, and using a computer, identify the vehicle from a stored database for subsequent billing by mail. The current generation of ETC systems can communicate both ways: they can "read" the tag as well as update the data stored in the tag. This capability enables the ETC system to deduct the amount of the toll from the driver's pre-paid stored-value tag instantly, thus doing away with the need for a subsequent billing and collection by mail.
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS No. 3.6.2

CONCEPT: Electronic Toll Collection Systems (ETC)

PROJECT NAME: “Open Road” ETC

LOCATION: Toronto, Canada; Melbourne, Australia

Electronic toll collection (ETC), which allows motorists to use toll roads without stopping at toll booths, has been justifiably hailed as a technological leap forward and a boon to motorists and tollroad operators alike. But the system can only be used by drivers with prepaid accounts and thus is limited to regular commuters and local residents. For intercity toll roads, the majority of whose customers are occasional users or out-of-state motorists that happen to be passing through the corridor, transponder-based ETC systems are of limited benefit.

Now comes a new technology that might make toll roads without toll booths a reality to everyone, not just regular users. The system utilizes video cameras that record the license plate number and bill the vehicle owner by mail. Regular users pay a lower toll if they carry a stored-value transponder Several new toll road projects have announced their intention to adopt the "open-road" ETC concept. They include Highway 407, a 36-km toll road in Toronto's northern suburbs; and Melbourne City Link, a new urban expressway network in Melbourne, Australia. In addition, three of the five private tollway projects proposed in Minnesota will also employ an "open road" ETC system.

The use of video cameras for traffic surveillance purposes and to enforce HOV and HOT lane use has raised a minimum of objections from the public and civil liberties watchdog groups. Whether using video cameras for billing purposes will be accepted with equal equanimity remains to be seen.

Cooperative Mobility Program
Center for Technology, Policy and Industrial Development
Massachusetts Institute of Technology
Traditional Electronic Toll Collection (ETC) systems have a major flaw: they can only handle regular commuters who have purchased the required transponders. Hence, toll road operators must still provide costly toll plazas and manned toll booths in order to accommodate occasional users without transponders. Highway 407 on the northern periphery of metropolitan Toronto, Canada, represents a technological leap forward by making toll roads without toll booths a reality for all motorists, not just for regular users. The highway, which started tolling operation in November 1997, employs a totally cashless toll collection system. All vehicles are able to travel without stopping at toll booths — even those that do not carry pre-paid accounts or stored-value transponders. The "407" is regarded by many as a precursor of the electronic toll road of the future.

Highway 407 is a 43-mile toll road arching from east to west across the northern portion of metropolitan Toronto. Intersecting all arteries radiating from central Toronto, the toll road has numerous interchanges at an average 1.5 mile intervals. This large number of entry and exit points was an important consideration in the decision to deploy a cashless, fully automated toll collection system that would dispense with the need for toll plazas and eliminate the possibility of serious backups at entry and exit ramps of a highway that is expected to handle in excess of 50,000 vehicles a day.

Tolls are collected in two ways. Regular commuters purchase windshield-mounted transponders which communicate with roadside sensors at entry and exit point. Commuters have the option of purchasing stored-value transponders or establishing credit card debit accounts. Cars that use the highway only occasionally are also able to travel without stopping at toll booths. Digital cameras positioned at entry and exit ramps photograph their rear license plates and transmit the image to a central data processing facility which matches the entry and exit data, analyzes the information for billing purposes and creates customer bills. Should the system lack the required information about a vehicle, it queries the central vehicle registry at the Ontario Ministry of Transport, which supplies the name and address of the vehicle owner.

INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS No. 3.6.4

CONCEPT: Electronic Toll Collection Systems (ETC)

PROJECT NAME: E-Z Pass

LOCATION: New York Metropolitan Area

The Triborough Bridge and Tunnel Authority (TBTA) collects $800 million a year at its two tunnels and seven bridges, most of it in coins, bills and tokens. But more and more, drivers are realizing they can speed their journey by participating in TBTA's E-ZPass electronic toll collection system that eliminates the need to present cash. The ETC program generates almost $300 million a year, making it the largest and most lucrative ITS project by far in the nation, and possibly the world.

Instead of collecting money or tokens from vehicles stopped in a plaza, stationary readers above designated lanes send out a dedicated radio frequency signal to an approaching vehicle. The signal instantaneously accesses a unique user-identifier stored in a small windshield-mounted tag. At the same time, the signal prompts a plaza computer to check the vehicle user's pre-paid account record. When the match is confirmed, the computer debits the appropriate toll from the account, completing a transaction in only a fraction of the time needed by coin/token collection.

E-ZPass lanes handle 900-1000 vehicles an hour. That is about four times the throughput of a manual cash lane and twice as fast as a coin basket lane. As of mid-March 1997, the TBTA had opened 368,000 E-ZPass accounts and issued 550,000 tags. Tags are being sold at a rate of 2,200 a day.

It is not only the tag users who are benefiting. During the rush hour, all drivers experience shorter or non-existent waits at toll plazas. At the Verrazano Narrows Bridge, on which E-ZPass began operation in October 1995, electronic lanes now handle about 50 percent of the traffic, and evening rush hour now ends 90 minutes earlier because of the overall queues are shorter. In all, TBTA has 250 collection points and 110 are equipped with E-ZPass.

Ref: Toll Roads Newsletter, March ‘97
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS  No. 3.6.5

CONCEPT: Electronic Toll Collection Systems (ETC)

PROJECT NAME: Melbourne City Link

LOCATION: Melbourne, Australia

Melbourne's City Link, scheduled to open in 1999, will be the world's second (after Toronto's Highway 407, see 3.6.3) all-electronic urban tollroad. Skirting the city's central business district and involving construction of two new tunnels and a bridge, the 22 km multi-lane highway will be financed by toll revenues collected entirely through electronic means.

Regular users will receive an electronic transponder when they open prepaid accounts. As a vehicle equipped with a transponder passes a tolling gantry, an appropriate debit will be made to the user's account. The toll structure will be distance-based: users will be billed according to the number of zones traveled, with six cordon points along the full stretch of the toll road. Casual users will have to purchase a day pass (for an equivalent of about $6) from retail outlets or by telephone (using a credit card) before they enter the toll road. Any vehicle not carrying a transponder will be captured on camera and issued a violation and fined by mail. Day pass holders (whose license numbers will be recorded at the time of purchase) will be exempt from any further charges.


Cooperative Mobility Program
Center for Technology, Policy and Industrial Development
Massachusetts Institute of Technology
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS  No. 3.7.1

CONCEPT: Commercial Vehicle Operations (CVO)

PROJECT NAME: Operation “Green Light”

LOCATION: State of Oregon, USA

Oregon's "Green Light" project is intended to provide the first wide area demonstration of fully automated electronic system of commercial vehicle preclearance. The system marries various state-of-the-art technologies into an integrated system that weighs, classifies, identifies, verifies and directs commercial vehicles at highway speeds. The system enables trucks, if they meet the necessary legal, safety and tax requirements, to completely bypass the port of entry and transit weigh stations.

The preclearance system integrates weigh-in-motion scales (WIM), automatic vehicle classifiers, overheight detectors, axle sensors and loops, automatic vehicle identification (AVI) systems, variable message signs, video technology and a supervisory computer system holding Public Utilities Commission data on all registered commercial vehicles. Within less than a quarter of a second, the vehicle is weighed, classified, checked for height, identified and the data sent to the central computer, where it is compared with the PUC data. If all data is in compliance, the vehicle is signalled to bypass the checkpoint and sent on its way.

The Green Light project is intended as a prototype model for the nation. The system is expected to improve the efficiency of commercial vehicle operation, improve the performance and safety of the highway system, and reduce the cost of enforcing safety and regulatory requirements.

Cooperative Mobility Program
Center for Technology, Policy and Industrial Development
Massachusetts Institute of Technology
The U.S. Department of Transportation has embarked on a new program, called the Intelligent Vehicle Initiative (IVI), to accelerate the development, introduction and commercialization of safety- and mobility-enhancing vehicle-based systems. The program will be conducted in cooperation with the motor vehicle, trucking and bus industries, State and local governments and other stakeholders. Activities will include research, development, prototype testing, operational tests and evaluation. The US DOT hopes that the IVI systems, after operational tests demonstrate the benefits of their integrated services, would be adopted by manufacturers as part of their standard product lines.

A set of 28 candidate technologies has been identified as candidate IVI services. They include Safety Services such as Rear-End Collision Avoidance and Automatic Collision Notification; Safety-Impacting Services such as Navigation/Routing and Real Time Traffic and Traveler Information; Platform Specific Services, such as Vehicle Diagnostics for Commercial Vehicles and Transit Passenger Information Systems for Transit Vehicles; and Supporting Services, such as Longitudinal and Letral Vehicle Control.

The IVI program will involve a mix of fully funded Government-sponsored research as well as collaboration with industry under cooperative cost-sharing agreements. The Department expects total annual funding for the IVI program to be $50 million.

Ref: U.S. Department of Transportation, Intelligent Vehicle Initiative Business Plan, November 1997
STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS

CONCEPT: Telematics

PROJECT NAME: Auto-PC

LOCATION:

On-board computers, allowing a driver to use simple voice commands to dial a cellular phone, control the audio system, store and retrieve telephone numbers, transfer data to and from other computers and, with optional wireless support, check electronic mail and real-time traffic reports, have been the subject of growing discussion. Emblematic of their arrival is the Clarion Auto PC. Billed as the world's first product that integrates car audio, computing functions, vehicle diagnostics, navigation and wireless communications, the unit has been initially offered for sale in California, Washington and Oregon. The Auto PC, powered by Microsoft Windows CE operating software, comes equipped with a wireless receiver providing access to the Internet and to an array of customized information such as real-time traffic reports, news updates, paging and e-mail alerts. The unit also has a vehicle diagnostic module that enables the driver to receive data from the vehicle's on-board computer system. Other built-in features include an electronic address book and a voice memo.

Telematics is no longer a futuristic concept, industry analysts agree. But while the technology of telematics is expected to continue acquiring enhanced capabilities, the rate at which this technology will penetrate the consumer market is still unclear. The decisive factor in the success of telematics and its consumer acceptance, may not be technology but its applications. For telematics to succeed, one must have services and information that motorists will find of value and you must create an awareness among consumers that these services and information exist. There are four kinds of potential applications that may make telematics useful to motorists: navigation, emergency services (including roadside assistance), real-time traffic information and “concierge” services. Once consumers realize they can enjoy the same ease of communication and access to services in the vehicle that they already enjoy at home and in the office, telematics is likely to find a mass market.

Rev. 5/99
STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS No. 3.8.3

CONCEPT: Telematics

PROJECT NAME: Mobile Digital Radio Satellite Service

LOCATION: Japan

The Nihon Mobile Broadcasting Corporation has inaugurated in May 1999 a digital satellite broadcasting service to motor vehicles throughout Japan. Eight of Japan's major car and electronics firms have joined in the new venture which will start broadcasts of multichannel programming by 2001. The consortium hopes to attract two million subscribers by 2003 and 10 million by 2010. Besides offering motorists news, sports and games, the digital feature will allow them to download maps for car navigation systems, e-mail and data for personal computers. (for similar services in North America, see, 3.8.5)

5/99
Automakers have realized that telematics represents potentially billions of dollars of added business from selling services to car customers. Market research has led them to conclude that motorists demand a variety of services. They want emergency response, business information, personal services, traffic information, entertainment and ability to execute commercial transactions. The car companies, therefore, are offering motorists a wide menu of services. Typically these include 24-hour emergency response, roadside assistance, stolen vehicle tracking, route guidance, vehicle diagnostics and concierge-type services. Ultimately, access to the Internet will also be provided. Pioneered by General Motors' On Star which is offered on 31 GM car models, OEM-provided motorist services are currently offered to owners of many luxury models, including Lincoln (RESCU), Lexus (Lexus Navigation System), Jaguar (Jaguar Assist), Mercedes-Benz (TeleAid), Infiniti (Communicator), and BMW (BMW Mayday Cellular Phone).

GM's OnStar service has had the longest track record and the most success so far. Using a combination of wireless communication and global positioning system (GPS) technology, the OnStar system links its more than 50,000 subscribers with a 24-hour service center manned by live operators who can do everything from summoning help in an emergency to giving driving directions, providing Yellow Page information, and making dinner reservations. (see 3.8.6)

In the future, GM plans to incorporate the OnStar system on some of its models as they leave the factory. Ultimately, GM officials say, the hardware may be offered free with a service contract, much as cellular phones now are.
INTERNATIONAL MOBILITY OBSERVATORY

INNOVATION FACT SHEET

STRATEGY: INTELLIGENT TRANSPORTATION SYSTEMS No. 3.8.5

CONCEPT: Telematics

PROJECT NAME: Digital Audio Broadcasting

LOCATION: USA and Canada

A satellite-delivered radio network for automobiles will soon be launched throughout North America. Developed by CD Radio Inc, the system will allow people to drive across the country and choose among 100 different formats of music and news without ever having their radio signal fade. Beginning late in 2000, consumers will be able to buy a special AM/FM/satellite radio, either factory-installed or as an after-market accessory. The radio will come with a battery powered satellite dish, about an inch-and-a-half in diameter, which car owners will attach with an adhesive backing to the car's rear window. The satellite dish will pull in signals from one of three CD Radio-owned satellites that are scheduled to be launched next year. This dish antenna will relay signals to the car stereo. Listeners will be able to choose among 50 channels of commercial-free music and 50 channels of news, sports, business and other programs. The signals for all 100 channels will be beamed continuously to the dish antenna. Consumers will have three options. They can buy an AM/FM/satellite radio set; an in-dashboard adapter that works with 95 percent of existing car radios; or a battery-operated satellite radio adapter that plugs into a cassette deck or CD slot.

CD Radio is a satellite-based application of digital audio broadcasting (DAB), a radio frequency wireless technology that offers high quality interference-free transmission of voice and data, including text and graphics. Radio broadcasters have evidenced interest in DAB because it would enable them to offer CD-quality sound and data services using their existing frequency spectrum allocations and allowing continued transmission of conventional AM and FM broadcasts. Canada has been a strong proponent of digital radio in North America. Last year, the Canadian Radio Television and Telecommunications Commission authorized 35 radio stations in Toronto, Vancouver and Montreal to launch Digital Audio Broadcasting (DAB) service. By the end of 1999 about one-third of Canada's 30 million residents will be within the broadcast range of digital radio broadcasts. That number will rise to 50 percent next year and 75 percent by the middle of the next decade. (see also, 3.8.3 for satellite DAB in Japan)

5/99
CONCEPT: Telematics

PROJECT NAME: On Star

LOCATION:

The number one concern of motorists, market research tells us, is safety, and one of the biggest fears is being stranded or injured and out of touch. General Motors’ OnStar service is designed to respond to and alleviate these concerns. Its hands-free, voice-activated cellular phone, combined with Global Positioning System (GPS) satellite technology, link the driver to the OnStar Center where operators can instantly locate the car and respond to any number of emergencies. For example, when an airbag deploys, the car’s system automatically notifies the OnStar Center. An operator can call the car, check on the occupants’ condition and notify the nearest emergency service, or dispatch an ambulance or towing truck to the scene of the accident -- even if the occupant is unable to call for help himself.

OnStar is more than just a security system. GM’s market research shows that travel-related services are a close second in what customers want out of new communication technology. OnStar Center’s “Advisors” can assist subscribers in hundreds of ways, from providing verbal turn-by-turn route directions and locating the nearest open filling station in the middle of the night, to making hotel and restaurant reservations or getting theater tickets in the destination city.

OnStar goes beyond providing “mayday” service. With the touch of a button, OnStar subscribers can get an immediate remote diagnostics of the vehicle’s engine, power train and brake system if a warning light flashes on the car’s instrument panel. Drivers who cannot find their car in a large parking lot can call the OnStar Center which will activate the car’s horn and flash its lights on command from the Center. And if the car owner locks himself out, the Center can issue a remote command to unlock the doors. The system can also detect an unauthorized entry into the vehicle and, with the help of GPS, track the stolen vehicle and direct the police to intercept it. The OnStar Center is open 24 hours a day, 365 days a year and can be reached from all 50 states and Canada.

Rev 5/99
Japan's drivers have seen a profusion of new motorist services since 1997. First to be launched, in April 1997, was Daimler Benz (now DaimlerChrysler) Intelligent Traffic Guidance System. Available as standard on E- and S-class models, ITGS offers proprietary real-time navigation service (with English-speaking voice guidance for visitors who cannot read signs in Japanese); “E-Call” emergency response service which automatically contacts rescue services in the event of a crash; and a welter of information raging from stock market updates, weather, flight departures and train schedules, parking information, “yellow pages” listings and even police speed traps. In March 1999, Daimler Benz added a parking reservation service, which it plans to extend to a fully interactive booking system for restaurants and cinemas. The service is offered in partnership with Japan's telecommunications agency (NTT). As of early 1999, the Daimler-Benz Interservices Telematik Japan had 3,000 subscribers, all but 500 of whom obtained it automatically when purchasing a model in which ITGS is standard. The others had to pay $3,300 for dealer-installed hardware. There is a $6 monthly service subscription fee.

Toyota launched a motorist service, named Monet, in November 1997. Monet provides route-planning and navigation service, traffic updates, news, weather, and ‘yellow pages, e-mail reception” and real-time visual images of road conditions. The service costs only $4 per month but does not involve a dedicated service center with human operators. Monet has 5,000 subscribers.

Other carmakers that have launched proprietary motorist services include Nissan and Honda. Nissan's service, called Compasslink, was launched in September '98. Compasslink offers a direct voice link to a proprietary information center in Yokohama that provides navigation services, emergency roadside services and a menu of information. The dealer-installed system costs $2,500 and has 1,000 subscribers. Honda's service, Inter NaviSystem, was inaugurated in July 1998 and, like that of Nissan and Mercedes Benz, has a proprietary manned service center based at Saitama, north of Tokyo. With 700 subscribers, it is the smallest of the four automaker-sponsored telematics services.

Ref: ITS International, March/April 1999
5/99