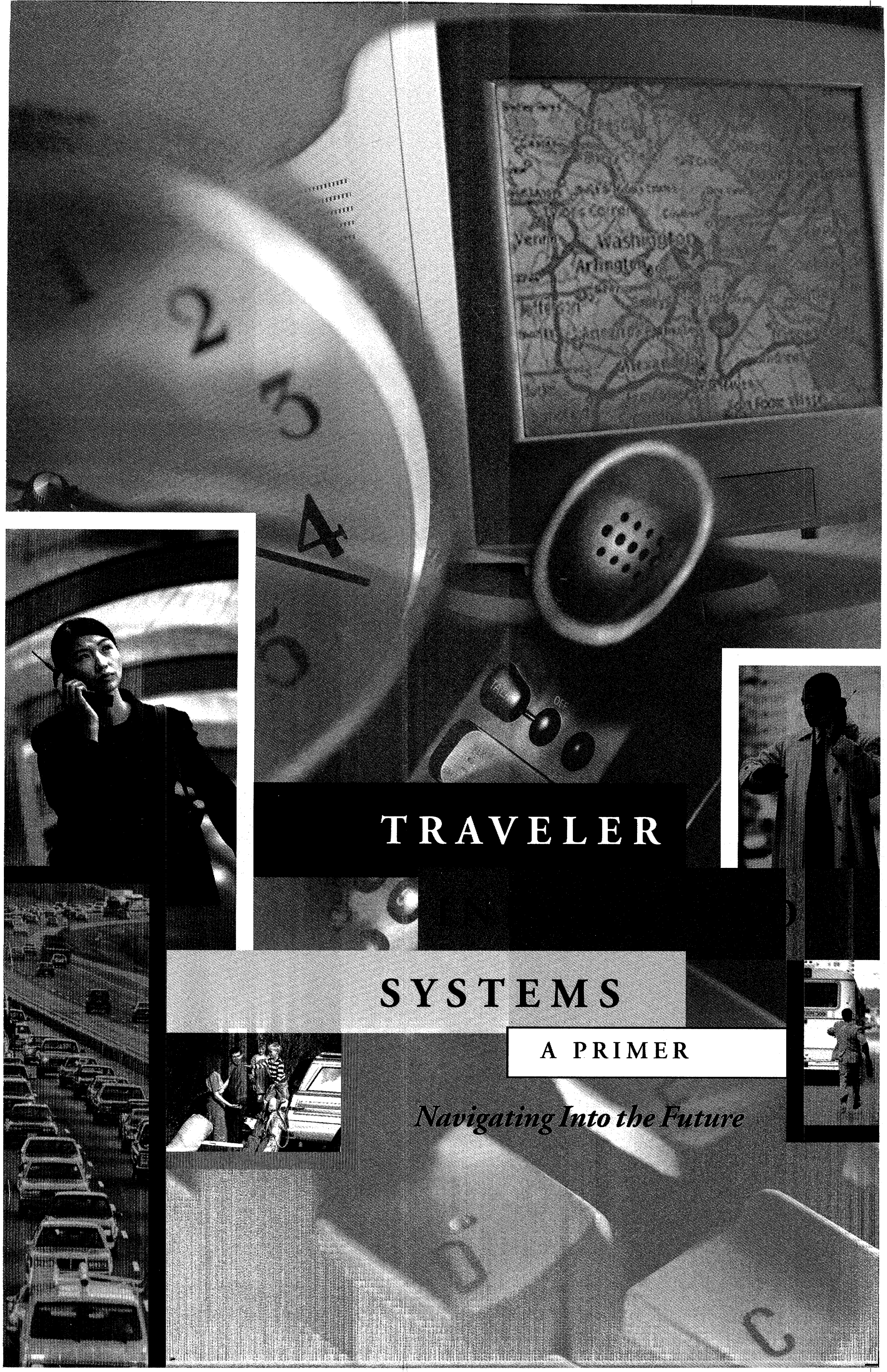
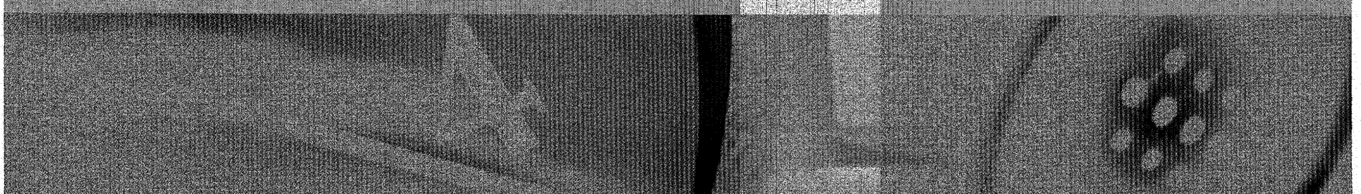


TRAVELER

SYSTEMS

A PRIMER

Navigating Into the Future



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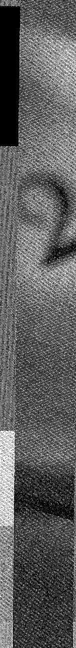
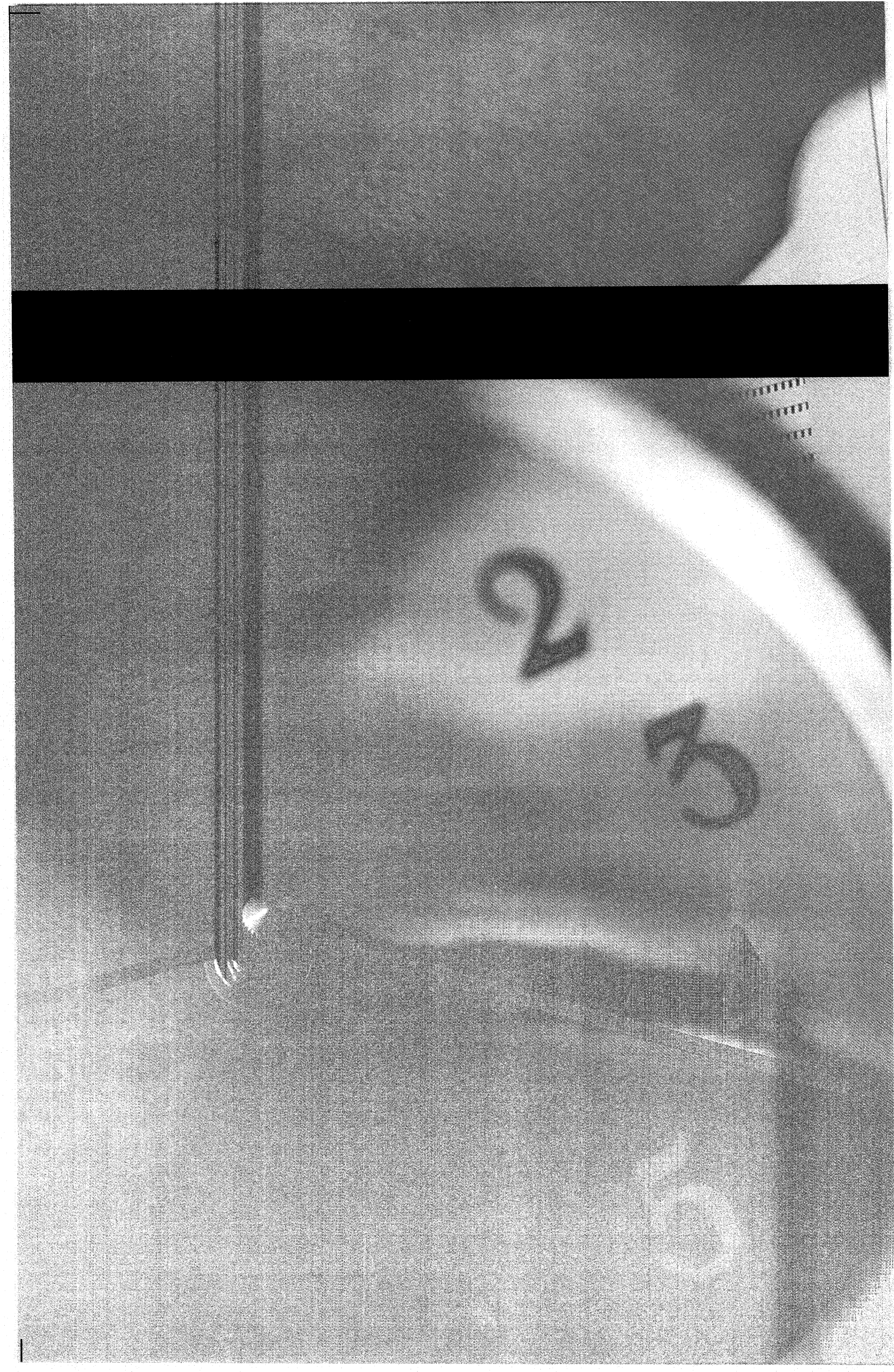
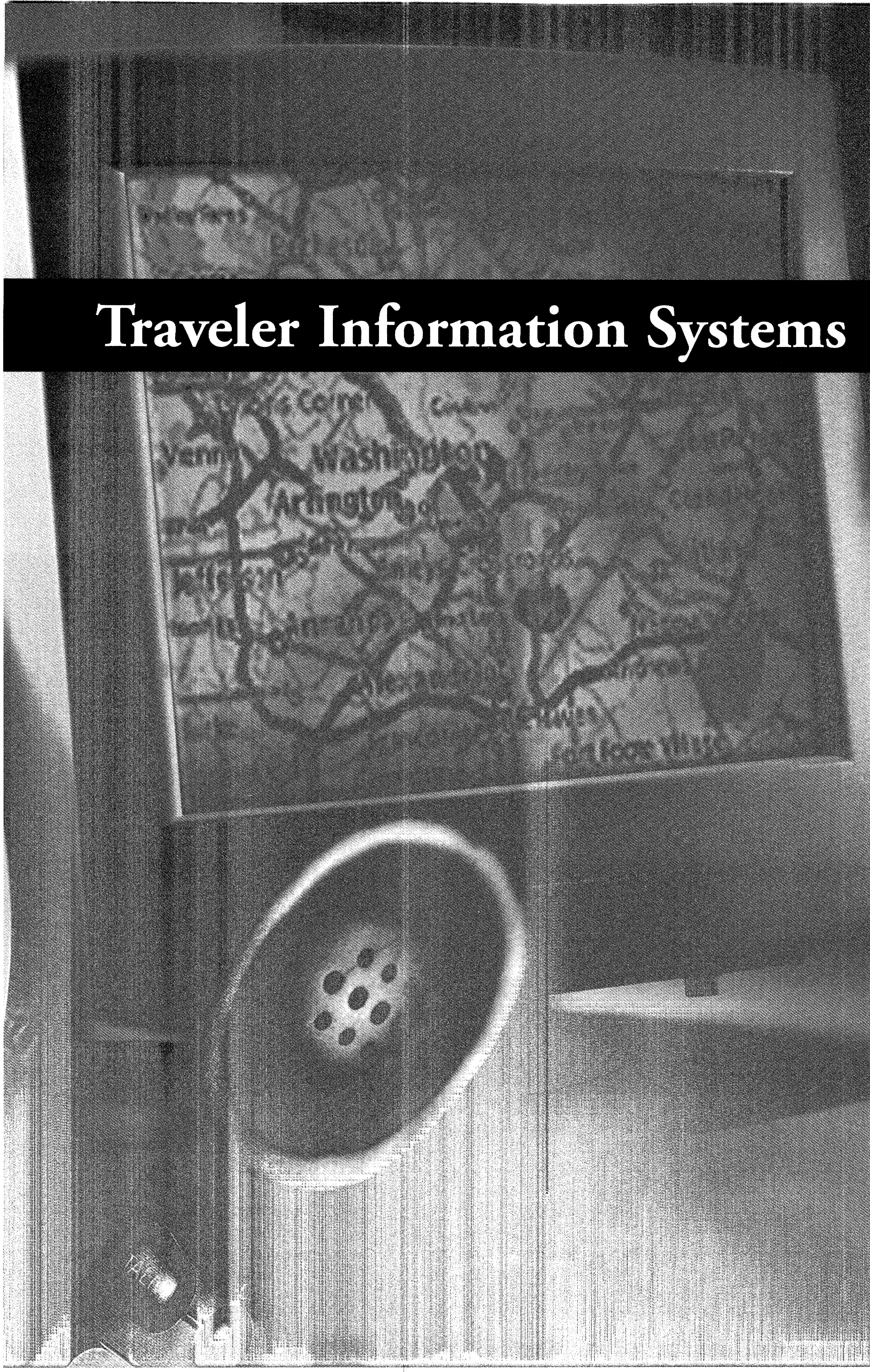
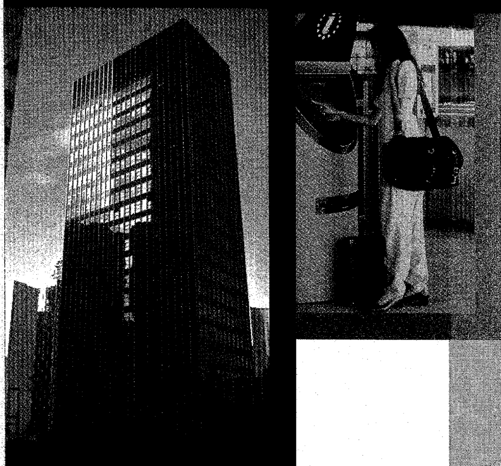




Traveler Information Systems



TRAVELER INFORMATION IS USEFUL



The transportation system users in these current and future scenarios have one thing in common: they rely on Intelligent Transportation Systems to improve their quality of life, safety and economic situations. Reliable, up-to-the minute information about transportation conditions helps them make better transportation decisions, both in their work and in their daily lives.

A **commuter** consults his radio or cable TV "Traffic Channel" to see if any unexpected traffic bottlenecks on the way to the office might cause a delay in his trip into the city...

A **transit passenger** waiting at a bus stop checks an electronic sign that indicates the bus will be arriving in four minutes, just a little late in spite of heavy traffic...

A **parts manufacturer** with a scheduled just-in-time delivery to a distant assembly plant consults his desktop computer to find out current weather and traffic conditions on the Interstate, in order to determine if he should allow any extra time for the shipment to meet his client's schedule...

An **operator** in a metropolitan transportation management center monitors a series of television screens for any traffic flow disturbances. If she spots any crashes or mechanical breakdowns, she immediately dispatches an incident management team, whose responsibility is to go to the scene and clear the roadway as rapidly as possible...

A **local salesperson** making a series of customer calls in the metro area consults her "auto PC" and downloads her prospect's file and e-mail updates. On the way to her next call, she pulls up the routing program to find the shortest path and updates her estimated time of arrival...

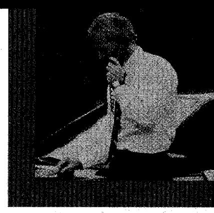
A **motorist** runs out of gas on a deserted road. She uses a "Mayday" device to signal a response center. A computer map at the center pinpoints the location of her disabled car, and the center calls the nearest service station. Help is soon on the way...

A **vacationing family** stops at a kiosk located in a highway rest area to check on the availability of campgrounds at their destination. If the campgrounds are already full, they can also use the kiosk to book a motel...

A **long-distance truck driver** consults his in-vehicle terminal to check weather conditions ahead and to see if there are any major road hazards and convenient detours to avoid them...

A **transit bus dispatcher** uses a computer to monitor the movement of a bus fleet in order to maintain the necessary separation between buses and to sustain regularity of service...

TRAVELER INFORMATION SYSTEMS DELIVER BENEFITS



Traveler information systems provide commuters and other travelers with timely and accurate information about travel choices. This information can be received at home, at work or en route via a range of communication media.

Prior to departure, radios, TVs, telephones, pagers and computers can provide timely information about travel conditions, enabling travelers to choose the best travel mode, route and time of departure. Timely information about incidents, traffic speeds along given routes, weather and road conditions, and special events that might disrupt traffic can be used by travelers to modify their travel plans. Information about transit routes, schedules and parking availability at rail stations can help travelers decide whether public transit is an effective option.

Once travel begins, car radios, visual displays and other more advanced communication devices can provide travelers with updates about traffic conditions, transit service, incidents and parking availability at their destination.

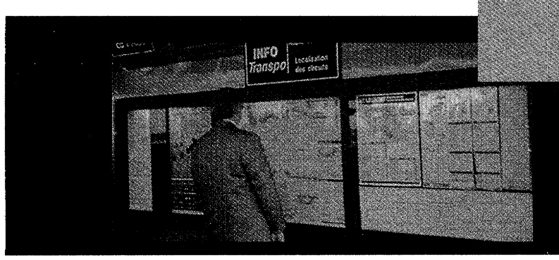
Roadside dynamic message signs — electronic signboards — and highway advisory radio can alert motorists to current weather and road conditions. Visual displays at bus stops and rail stations can inform waiting passengers about arrival time and destination of the next train or transit bus. Vehicle-based route navigation systems containing map displays can guide motorists traveling in unfamiliar surroundings to their destinations. Real-time traffic flow data can alert motorists to traffic problems ahead and re-route them around crashes and congestion bottlenecks.

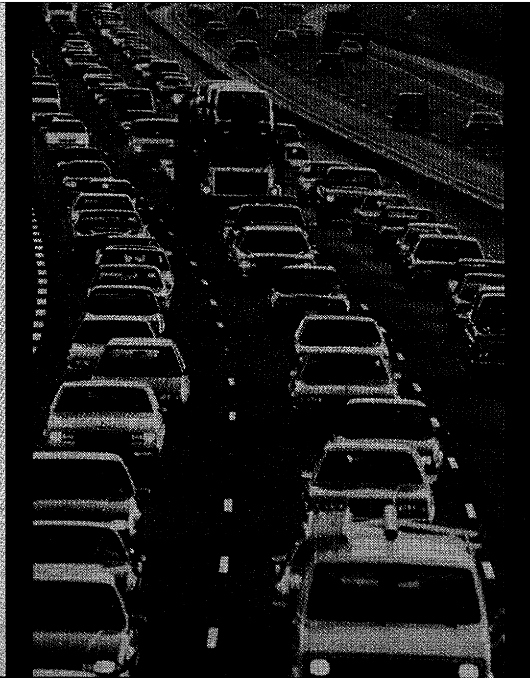
In the event of a crash or mechanical breakdown, emergency "Mayday" systems enable travelers and operators of transit vehicles to call for assistance. Global Positioning Systems (GPS) can automatically provide vehicle locations even if the driver is disabled or cannot accurately describe the location.

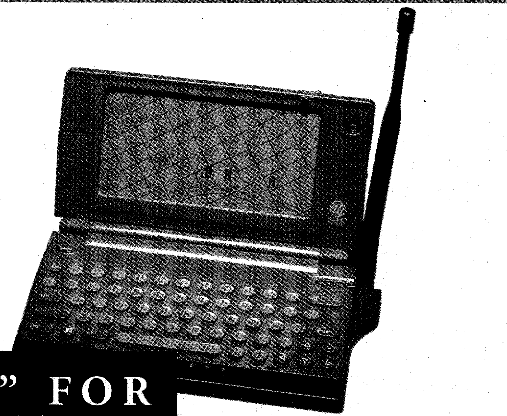
Consumer surveys indicate that "Mayday" systems are considered among the most valued features of traveler information systems.

Searching for destinations and roadside services can be aided by electronic yellow pages accessed through the Internet and kiosks located in airports, shopping malls, transit terminals, hotels and highway rest areas. Also available are in-vehicle traveler information services listing lodging, restaurants, roadside services, tourist attractions, weather and airline arrival departure information.

Intelligent transportation systems can save commuters time and save businesses money.







THE "CUSTOMERS" FOR TRAVELER INFORMATION

Traveler information systems serve four sets of customers: individual travelers, businesses, commercial carriers and the public sector. Each group benefits from having timely and accurate travel information in different ways.

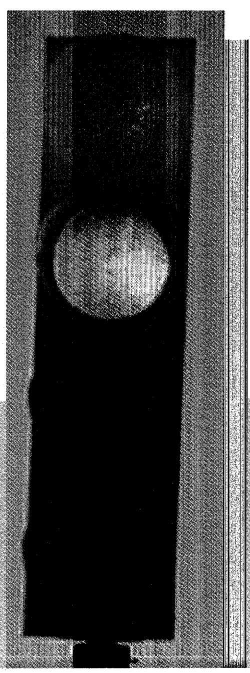
Commuters, Tourists and Through-Travelers can make informed decisions about the transportation mode and route that will get them to their destination in the fastest, safest and most efficient manner. Traveler information systems can:

- Warn motorists about dangerous road conditions ahead (incidents, ice, low visibility, etc.) and alert them about special events that could disrupt their travel plans
- Reduce travelers' frustration and anxiety by keeping them better informed of unexpected delays and causes of traffic tie-ups, and by helping travelers find detours around traffic bottlenecks
- Guide travelers to destinations in unfamiliar surroundings and assist them in finding lodging, places to eat and roadside services
- Summon assistance in case of emergency or mechanical breakdown ("Mayday" systems)
- Help transit users plan their itineraries and provide them with timely information about bus and train schedules and arrival times

Businesses and commercial carriers can operate more efficiently thanks to improved ability to schedule, deliver and receive goods and services.

Businesses and Commercial Carriers can operate more efficiently thanks to improved ability to schedule, deliver and receive goods and services. Traveler information services can:

- Assist shippers in making just-in-time deliveries
- Help trucking firms and package delivery services better manage their fleet operations
- Help manufacturers and other commercial enterprises with time-sensitive shipments
- Aid business travelers in keeping their appointments
- Assist transportation service providers in responding to calls for service



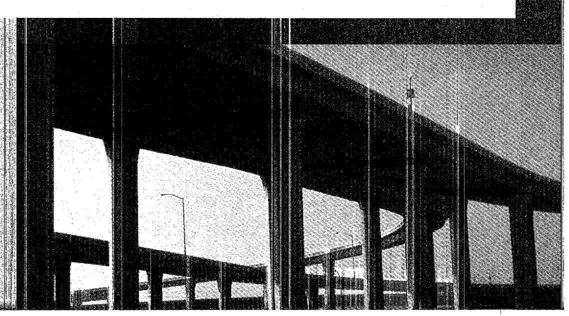
Transportation Agencies can provide more effective and responsive public services. Traveler information systems help local governments better manage and operate their transportation facilities.

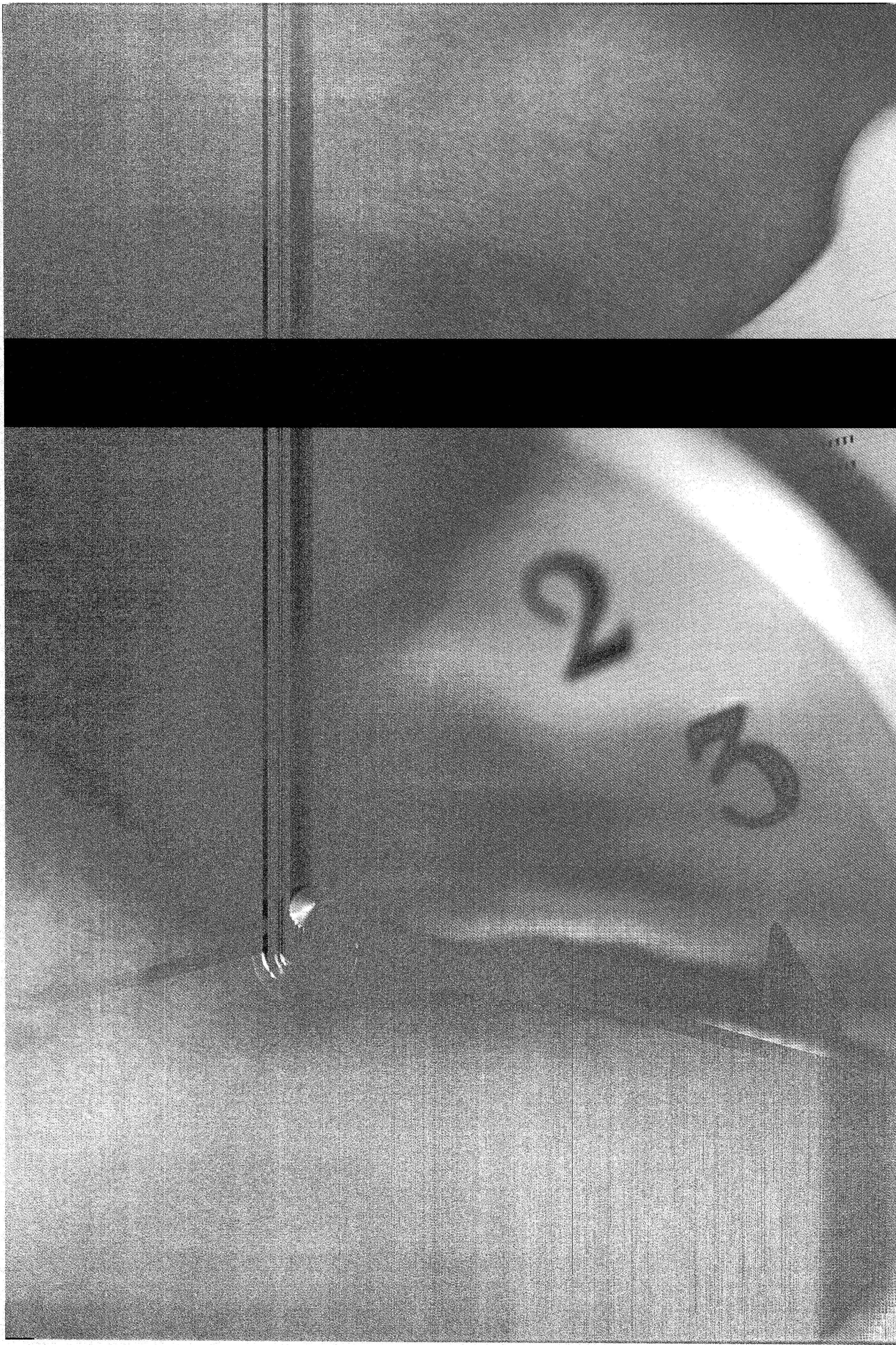
- Real-time data from vehicle sensors and vehicle probes tells local authorities how to adjust the timing of traffic signals to maintain optimum conditions for traffic flow
- Information obtained through remote video cameras allows incident management teams and emergency response crews to spot and respond rapidly to highway incidents
- Data obtained from automatic vehicle location systems allows transit and school bus dispatchers to monitor the movement of buses, maintain on-time performance and take corrective action to restore regularity of service

Other Local Government Personnel can capitalize on the same communication and information processing infrastructure that is used to monitor highway incidents, traffic conditions and transit fleets. This information can be employed in government functions such as:

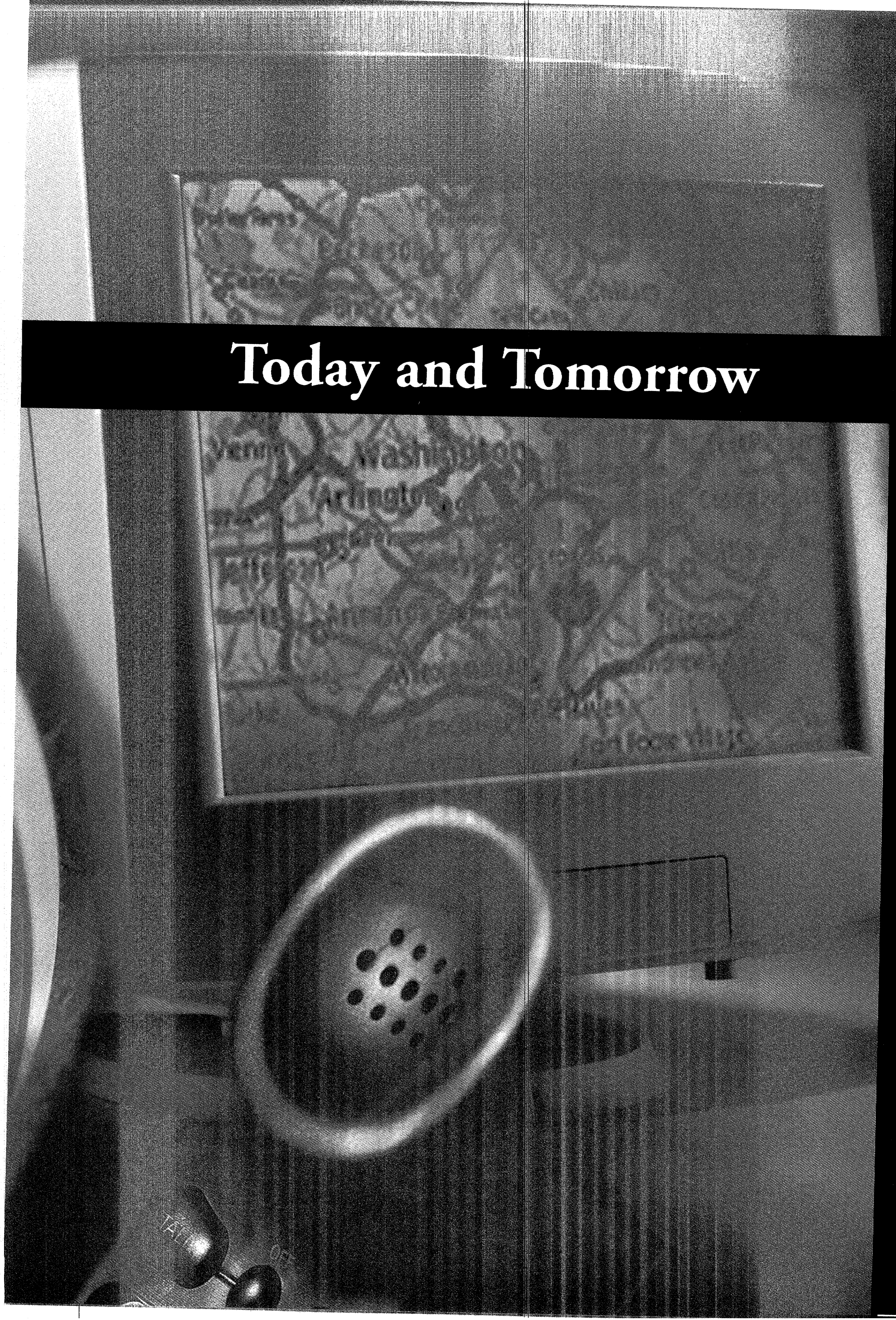
- Coordinating evacuation and emergency services following natural disasters
- Managing special events (sports, concerts, etc.)
- Delivering tourist services and managing tourist facilities
- Operating public safety, police, fire and public utilities fleets, and school bus transportation
- Generating archival data for transportation planning purposes

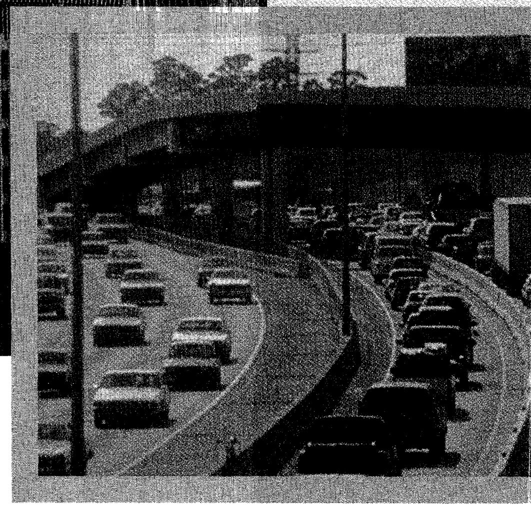
In summary, efficient management and operations of our existing transportation system is increasingly important. Investment in an advanced information and communication infrastructure not only is essential to the effective functioning of the transportation system, but also offers an opportunity for government-wide efficiencies and economies.





Today and Tomorrow





TRAVELER INFORMATION SYSTEMS IN OPERATION

Traveler Information Systems: Part of the Information Revolution

The Information Revolution has affected virtually every sector of human activity, and transportation is no exception:

- Modern computers are able to retrieve, process and display enormous quantities of transportation information with lightning speed
- Wireless technology makes it possible to communicate this information over long distances without the need for land lines, and to deliver it to vehicles and portable communication devices
- The Internet offers access to real-time transportation information on demand, from homes and offices
- Sophisticated detection technologies allow us to monitor traffic conditions, spot incidents and determine exact location of transit vehicles in real time

Put all these capabilities together, marry them with transportation infrastructure, and you get modern Traveler Information Systems, providing up-to-the-minute information for travelers, businesses and commercial carriers.

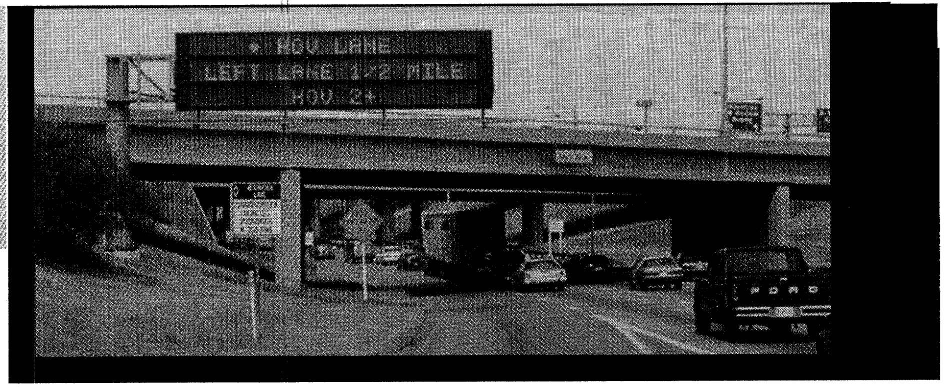
Traveler Information Has a History as Well as a Future

Traveler Information Systems have gone through several stages of evolution. In the first stage, prior to the 1970s, State and local transportation agencies monitored traffic and gathered traffic data as part of their traffic control and freeway management responsibilities. However, they seldom shared this information with the traveling public. Except for occasional uses of variable message signs, the collected data remained in the possession of traffic management authorities and was used for internal purposes only.

Throughout the 1980s, State departments of transportation (DOTs) continued large-scale programs that equipped metropolitan freeway networks with ramp metering, loop detectors and video surveillance cameras. They also began using variable message signs and highway advisory radio to communicate with motorists. In the mid-1970s, live traffic reports made their first appearance on the radio, with radio stations using airborne traffic reporters who offered their services to radio and TV stations in exchange for advertising time slots. A new traffic reporting industry was born. During the late 1980s, commercial traffic reporting expanded to all major metropolitan markets, reaching an estimated audience of 100 million people.

During the 1990s, the technology of "intelligent transportation systems" (ITS) has come into its own. State and local governments have begun to apply this technology in experimental settings, gaining more experience and familiarity with ITS each passing year. By 1998, numerous urban areas had launched or were in the process of launching regional traveler information systems as part of the ITS model deployment program or as part of State/local initiatives.

Concurrently, providing timely traveler information to the public has become a tenet of good public policy. The earlier tendency to treat transportation data as only having value to transportation managers has given way to a recognition that real-time



information can help travelers make more informed travel decisions and can lead to a more efficient and better functioning transportation system. At the same time, private traveler reporting services have become more entrepreneurial. They target markets beyond the traditional radio and TV audience and have developed a capability to deliver customized traveler information in a variety of transmission formats to online computer services, vehicle navigation systems, pagers, hand-held devices, cable TV and electronic kiosks.

Providing timely traveler information to the public has become a tenet of good public policy.

Today, there are a wide range of traveler information systems in operation – and many others in various stages of development

Broadcast services are widespread. Most metropolitan areas already have benefited from summary traffic reports on commercial radio and TV. Some cable TV and radio stations offer extensive morning and afternoon drive-time coverage. This programming is typically developed by specialized traffic reporting agencies who provide traffic information in return for commercial sponsorship.

Many communities around the country also have government operated traffic information services via dial up telephone or public radio and TV stations.

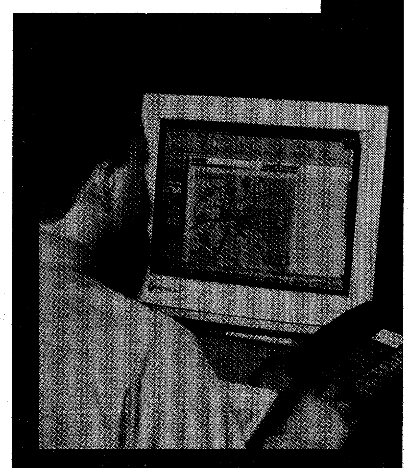
Both government and private entities have expanded their operations to the Internet. There is an increasing number of Internet web sites offering regional traffic maps with camera views and congestion or breakdown information. Some state and local governments have also placed traveler information on kiosks in strategic roadside and terminal locations and are experimenting with similar services in the workplace.

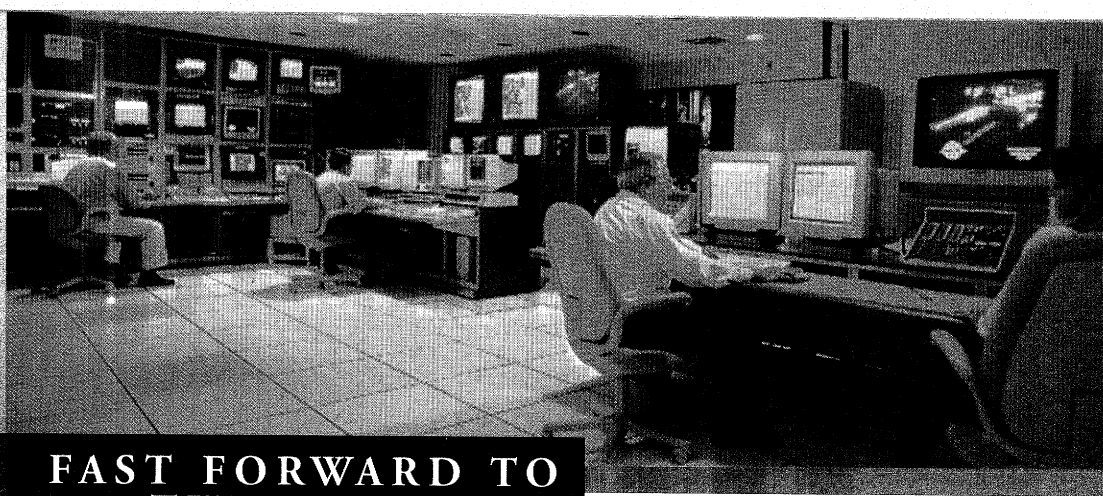
The U.S. Department of Transportation is cooperating with State and local governments and private sector partners in several "model deployments" of traveler information and related services.

Personal travel information is also becoming more widespread. More recent developments include private businesses (including many of those offering broadcast information) providing custom-tailored traffic information for a fee via various personal communication devices such as phone, cellular phone, pager and PC.

In-vehicle traveler information services may soon be available. Traveler information may soon be available as part of "auto PC". In some countries (most notably Japan), in-vehicle PC-like devices are already widespread. They provide traffic information packaged with other travel-related and entertainment services using CD inputs and wireless communication to information providers. Auto PCs are also in the early stages of deployment in the United States.

Examples of these various types of traveler information services, both in the United States and abroad, are presented in the *Real World Examples* section.





FAST FORWARD TO THE YEAR 2010

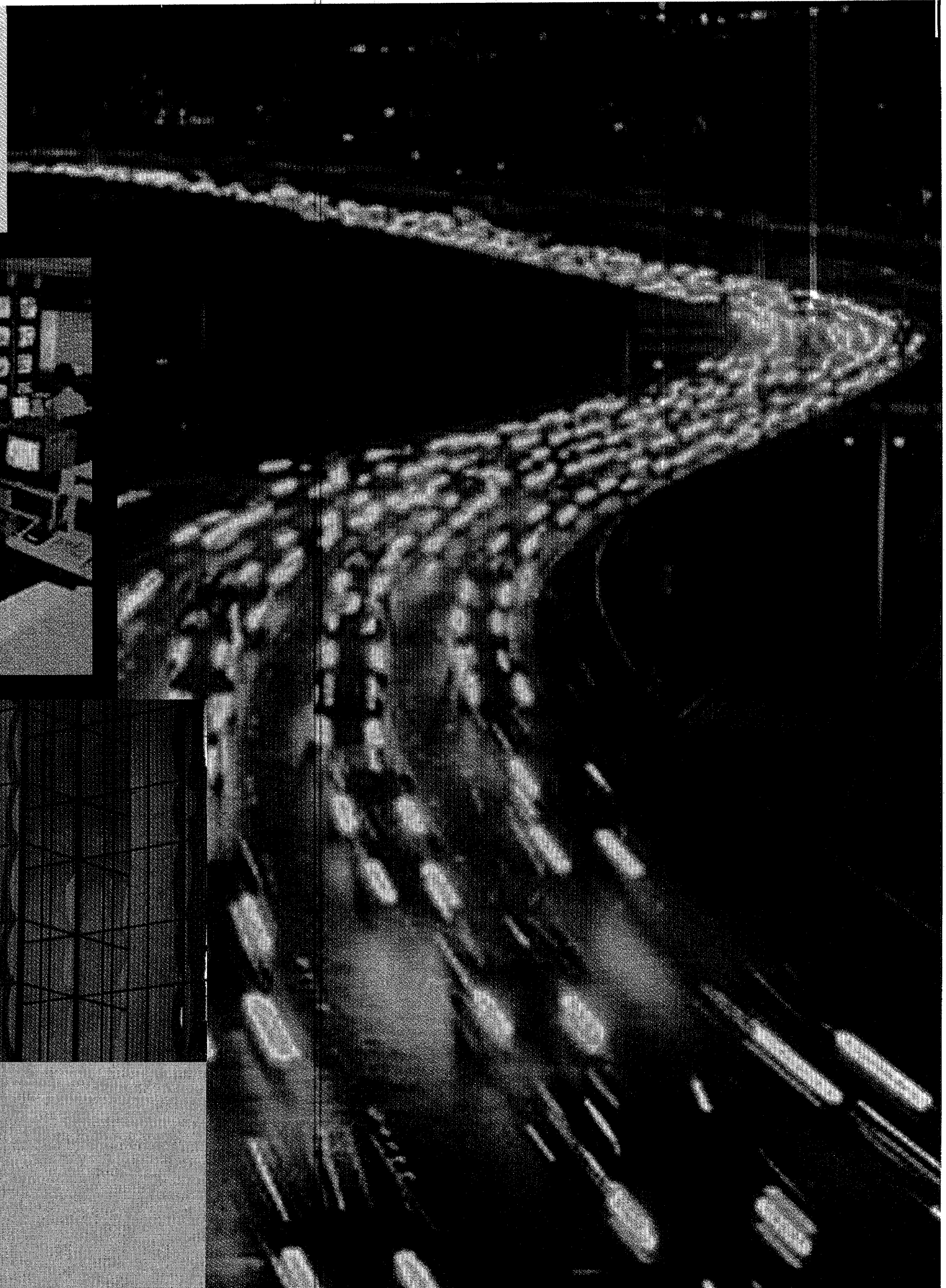
The following scenario is not a futuristic fantasy. It is an illustration of how the technology of Intelligent Transportation Systems (ITS) will soon be helping us in our daily lives. In less than a decade, Intelligent Transportation Systems have progressed from an experimental concept to a functioning technology. Today, ITS and its traveler information component are well on their way to becoming an integral element of this nation's metropolitan and rural transportation systems.

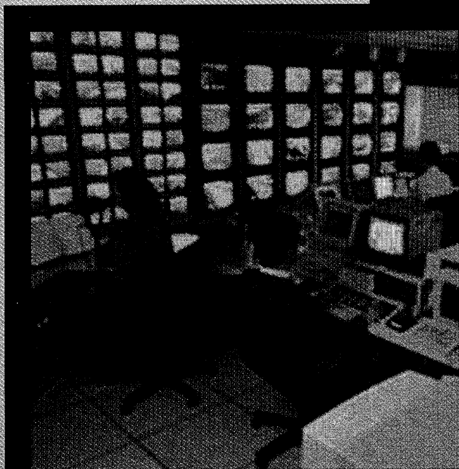
In less than a decade, Intelligent Transportation Systems have progressed from an experimental concept to a functioning technology.

Jane Commuter is about to leave for the office. She logs on her computer and finds an e-mail message from TRIS, a private traveler information subscription service that keeps her travel profile in its database. The message informs her that there is a serious back-up on her regular commute route because of an overturned tractor trailer, and that normal traffic conditions will not be restored on the freeway until 9:30 am.

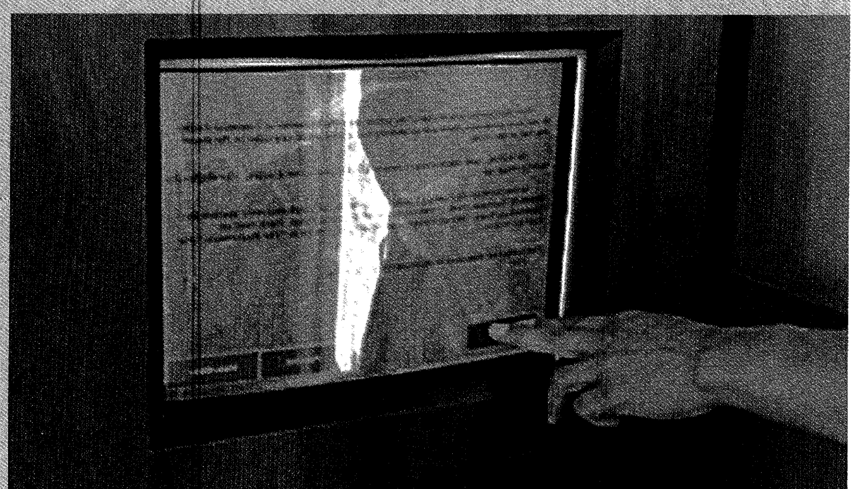
Jane clicks on another icon. The screen dissolves into a map of the area showing transit routes and recommended alternate roads around the incident. She clicks on the commuter rail station nearest to her home to check on the arrival time of the next train and notes that the parking lot at that station is already full. Of the three alternate highway routes, two are solid red, indicating stop-and-go traffic, but the third is mostly yellow with some intermittent green segments. Jane selects the third route and learns that current estimated trip time to her office is 26 minutes. Not bad, considering the alternatives. As Jane starts her commute, she is a little apprehensive about finding her way through unfamiliar suburbs, but knows that the on-board guidance and navigation unit will give her clear and accurate directions. The directions are communicated by synthesized voice, but Jane can also follow her progress on a map display, where her car is shown as a bright green fluorescent blip.

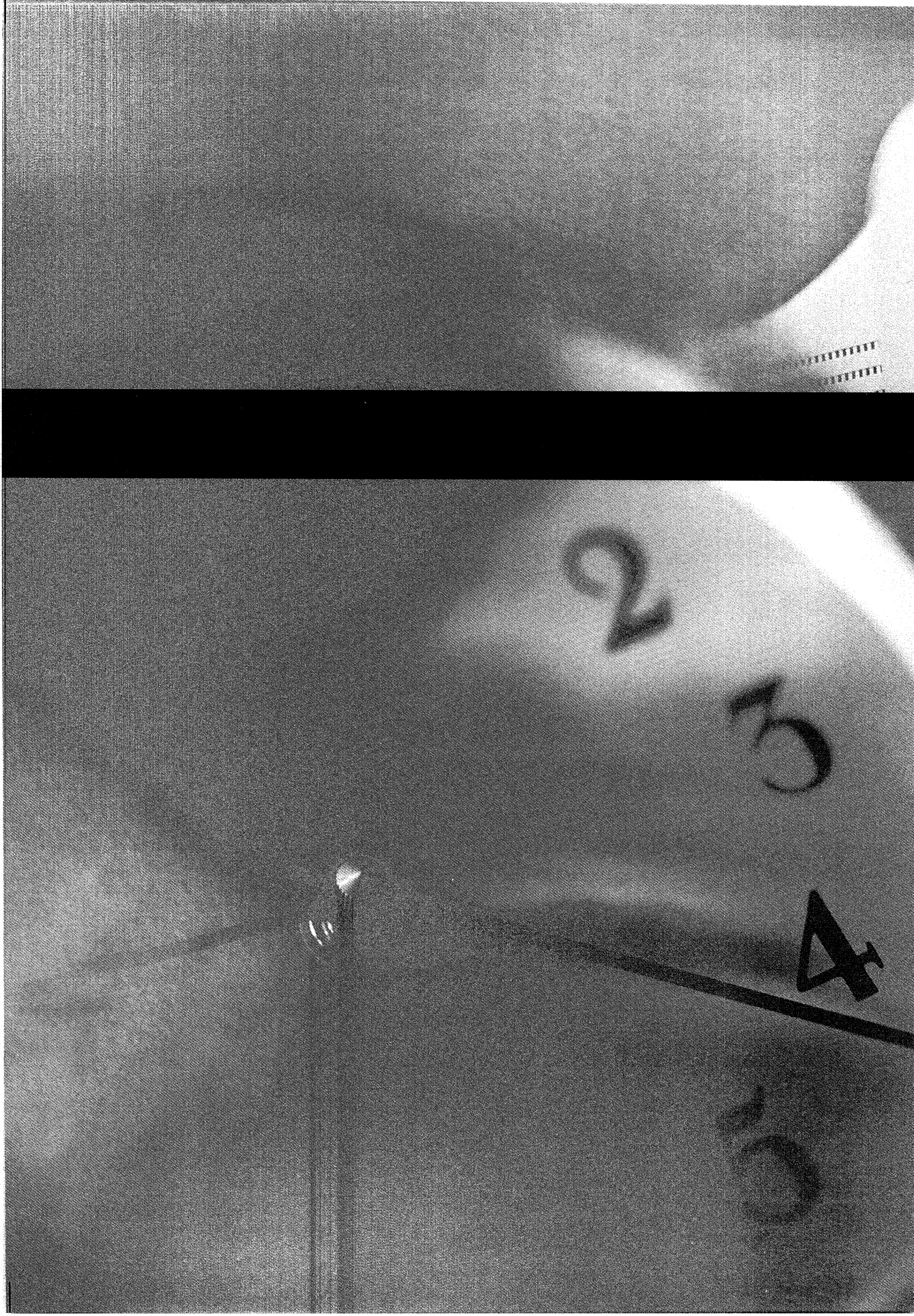
After spending the day at the office, Jane is ready to head for home. Her computer is silent,





indicating that, so far, travel conditions on her way home are normal. However, there is an advisory e-mail message from TRIS reminding her that there is a night game at the stadium tonight that might affect travel time on the freeway. Jane decides to leave a little earlier than usual in order to beat the traffic and pick up her children at the daycare center before the late pick-up penalty kicks in. In the meantime, her husband, Joe, consults the TRIS web page on his office computer and notes that the bus he regularly takes home will be on time. They both sigh with relief and marvel at the ease with which they can access accurate real-time travel information. And they wonder, how did people ever manage before the advent of traveler information systems?

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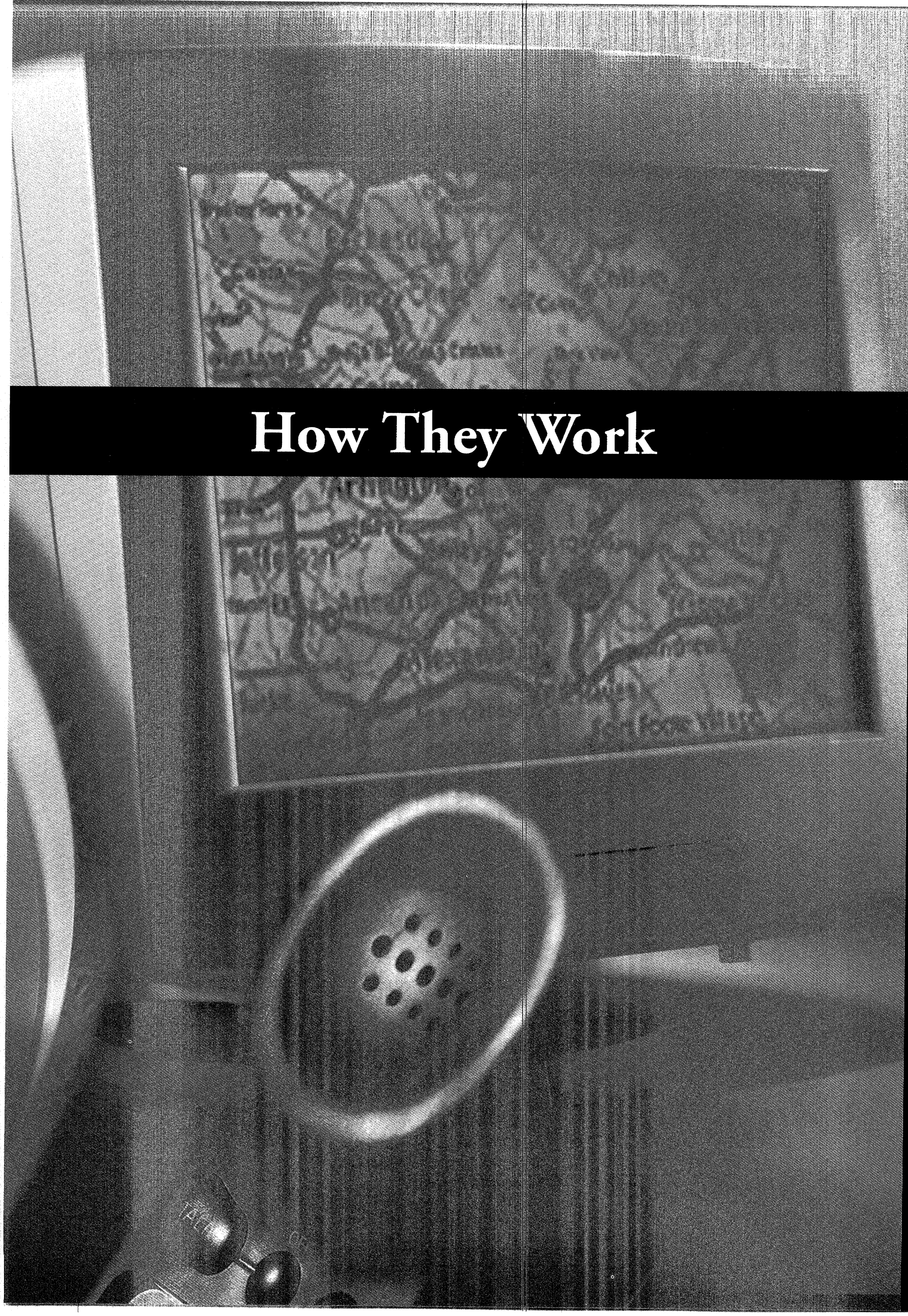
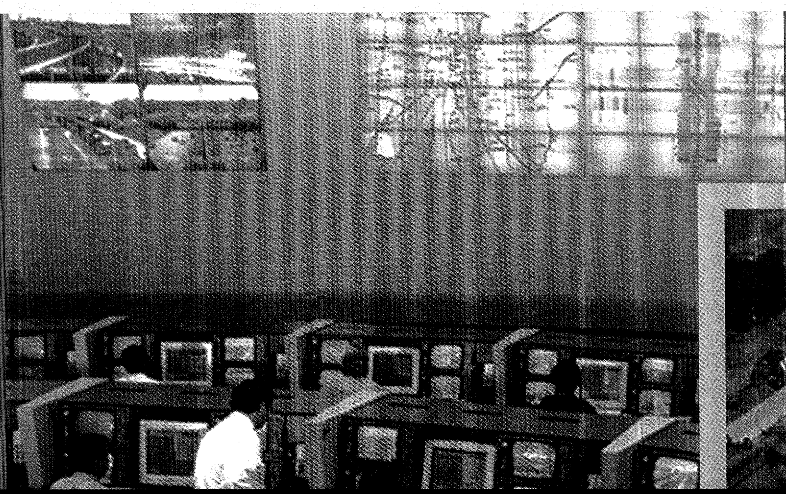
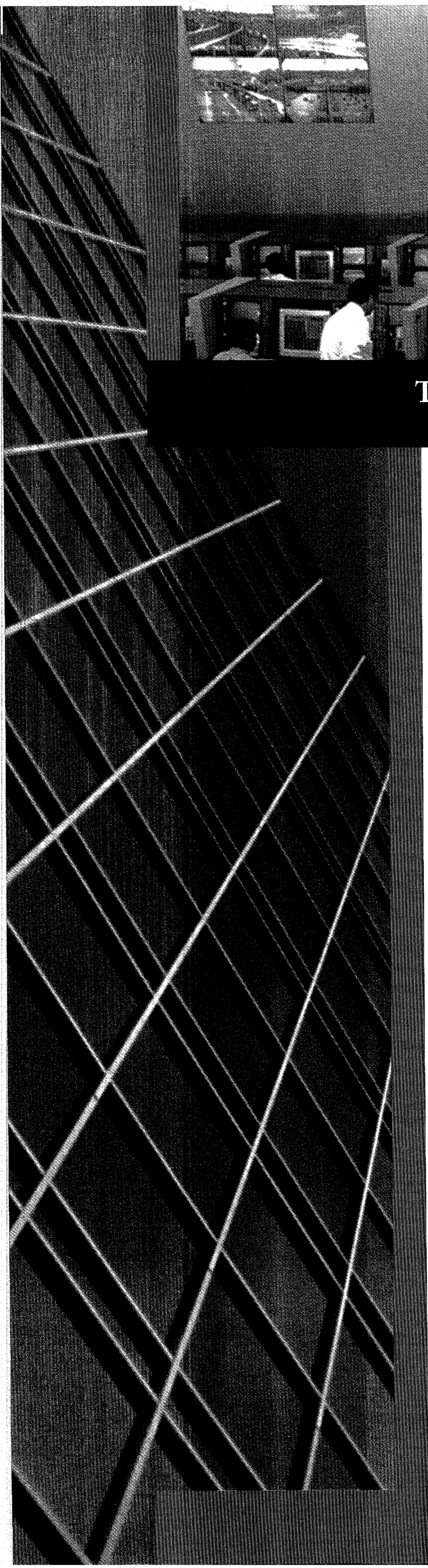


How They Work





THE ELEMENTS OF TRAVELER INFORMATION SYSTEMS

Every traveler information system involves three separate but related functions: Data Collection, Data Processing and Information Dissemination

Crucial to the success of any traveler information system is the collection of timely and accurate data on transportation conditions. This includes data on lane occupancy, traffic volumes, traffic speeds, road and weather conditions, road construction updates, special events likely to affect travel, movement of transit vehicles and early detection of incidents. Carrying out this function is an array of increasingly sophisticated sensing and detection devices, including:

- **Vehicle Sensors**. Inductive loop detectors buried in the pavement and other electronic sensing devices capable of recording the passage of vehicles have been the mainstay of data collection operations for many years. Video Imaging Devices, mounted overhead, are increasingly used in place of loop detectors to monitor traffic and measure vehicle speeds. Their installation does not require undersurface installation and avoids associated traffic disruption.
- **Closed Circuit Remote Video Cameras.** The use of cameras to monitor traffic flow and help traffic operations managers detect and clear highway incidents has increased in recent years.
- **Automatic Vehicle Identification.** This technology, widely used in electronic toll collection, comprises vehicle-mounted transponders and roadside reader units. As vehicles pass roadside reader installations, they trigger the transponder to send coded data via a receiving antenna to the roadside unit. The data from the transponder is sent to a computer for processing and storage.
- **Vehicles equipped with transponders**. "Probes," as they are known, are equipped with small communication devices call transponders, that can be used to monitor traffic and obtain travel speed data. Transponder readers are installed along roadways at short intervals. As individual vehicle-mounted transponders (each with a unique signature) are detected by successive readers, vehicle speeds and average travel times can be calculated.
- **Cellular Telephones**. According to one estimate, 80 percent of all highway incidents are reported by motorists over cellular phones.

- **Parking Information Systems**. These systems use vehicle sensors in parking facilities to detect unoccupied spaces. Information on parking availability is then displayed in real-time on electronic variable message signs installed on approaches to the parking facilities. This information saves motorists time and reduces wasteful driving in search of parking spaces.
- **Automatic Vehicle Location (AVL).** This technology, utilizing Global Positioning Systems (GPS) or radio frequency transponders, is used in fleet management and emergency response systems. One common application is to monitor location of transit vehicles to ensure schedule adherence. AVL/GPS technology also is used to pinpoint the location of disabled vehicles.

A Traveler Information Center serves as the "brain" of a traveler information system. This facility — either a dedicated facility or part of an existing traffic management center — serves as a central point for collection of all transportation data and its subsequent translation into communicable information. Two categories of information are typically received and processed by a Traveler Information Center: predetermined (static) information and event, or conditional, information. The former includes information that is not likely to vary from day to day, such as transit schedules, long-term construction schedules and notification of special events. The latter varies from day to day. Traffic congestion advisories and announcements of disruption in transit service are classic examples of event-driven information.

The function of a Traveler Information Center is to merge various data streams obtained from electronic monitoring devices, transportation agencies and human observers (including airborne observers, police and emergency services, highway maintenance crews, roadside assistance units, and transit and airport operators) and process them into communicable information. The output may take different forms, and can be tailored to the needs of the recipient. Until recently, the principal products were bulletins read on the air by experienced radio reporters, or recorded in audiotext for transmission over automated telephone call-in systems. In the last few years, Traveler Information Centers began to translate traffic data into computer graphics displays for presentation in TV newscasts and on the Internet. Still more recent are video snapshots of freeway traffic displayed on television and Internet web sites.

In the future, the output of Traveler Information Centers is likely to be more differentiated. In addition to traditional text and graphic presentations, it may include a range of electronic formats suitable for transmission to pagers, in-vehicle navigation units, hand-held computers and other advanced communication devices. Future information output is also likely to be more custom-tailored (e.g., by specific route segments) to the needs of individual clients. Dedicated cable TV channels providing continuous traveler announcements may be not be far off.

Dedicated cable TV channels providing continuous traveler announcements may not be far off.

HOW TRAVELER INFORMATION IS DELIVERED AND DISPLAYED

Radio is the most common channel for receiving pre-trip and en-route traveler information. Traveler reports over the radio reach an estimated audience of 100 million daily listeners. The dominant role of the radio can be explained by its near-universal availability at home, in vehicles and in the workplace; the ease with which radio-based traffic reports can be accessed during drivetime; and the cost-free access to the information.

Television (including **Cable** TV and **Interactive** TV) is the next most common channel of traveler information. TV newscasts visually depict traffic conditions with graphic color maps that pinpoint incident locations and show congestion levels. Increasingly, they also provide live video shots of freeway traffic.

Telephone is used to access telephone call-in systems that provide recorded traffic advisories and transit-related information (audiotext). Wireless (cellular) telephone is used for the same purpose, with the added convenience of providing access from moving vehicles and places not equipped with wireline telephones.

Kiosks with touch screen monitors offer access to traveler information in shopping malls, airports, transit terminals, hotel/motel lobbies and highway rest areas. Many kiosks, designed for visitors and tourists, provide information on hotel accommodations, tourist attractions, transit services and other services of interest to visitors.

Personal Computers provide the means to receive traveler information from the Internet and obtain personalized e-mail traffic reports from Information Service Providers.

The **Internet**, through the World Wide Web, offers real-time traveler information from public and private sources. Many local transportation agencies have set up web sites that display color-coded congestion maps and provide video snapshots of freeway traffic. They can also show the status of transit operations.

In-vehicle Navigation Devices provide turn-by-turn directions to driver-designated destinations, using voice and visual instructions. Future refinements may include dynamic guidance that takes account of prevailing traffic conditions and re-routes the driver around incident sites and traffic bottlenecks.

Pagers can be used to receive short personalized messages alerting their owners to unusual conditions on their customary travel route.

Personal Communication Devices (PCDs) provide two-way communication. Unlike pagers, PCDs can be used to query information sources as well as receive information.

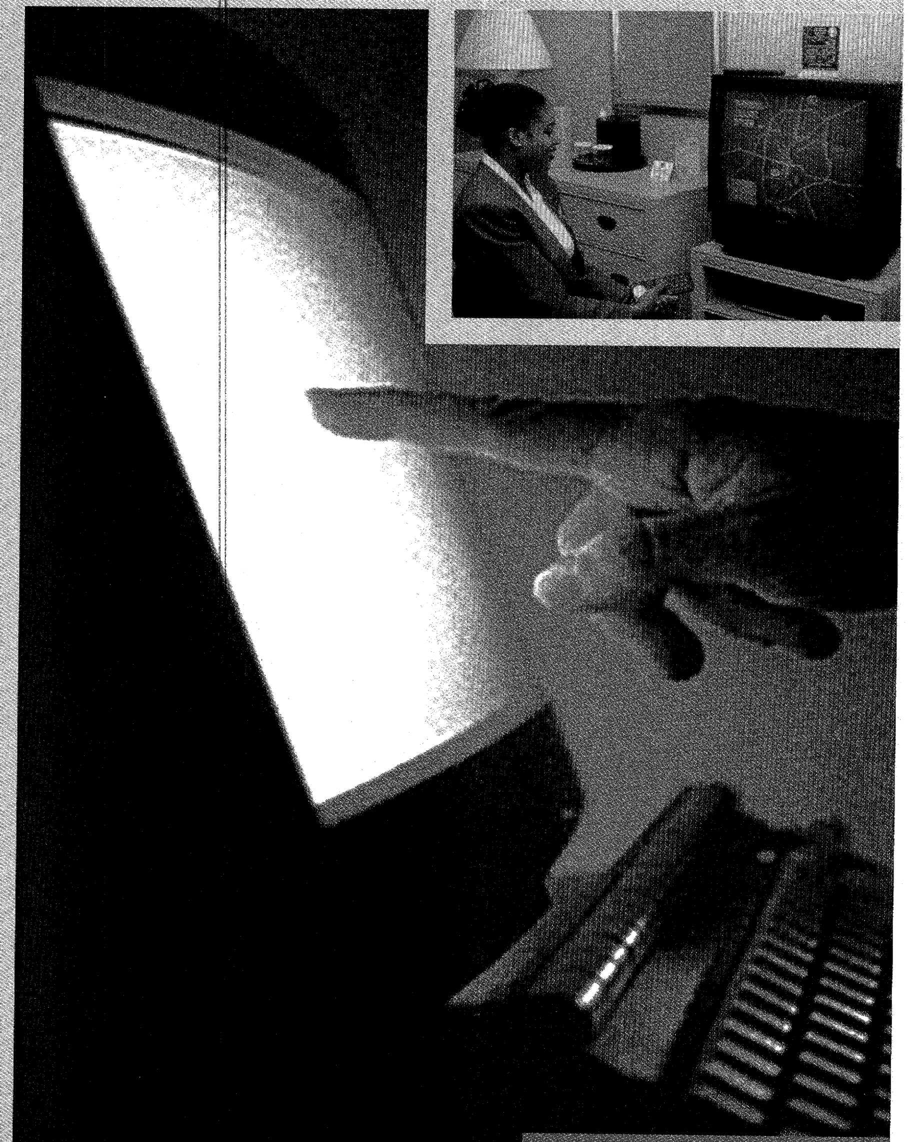
Variable Message Signs (VMS) contain short messages alerting motorists of road conditions and hazards immediately ahead. Specialized variable message signs are used to inform motorists of the location of parking facilities and the amount of available parking space in those facilities.

Passenger Information Displays inform passengers waiting at bus stops and train stations of the actual (rather than expected) arrival time of the next bus or train.

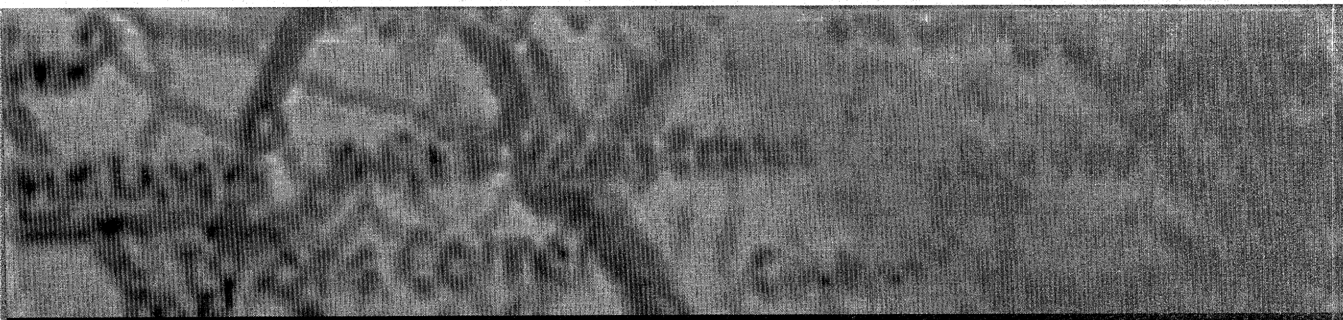
Highway Advisory Radio (HAR) comprises low-powered short-range roadside radio transmitters providing traffic advisories. HAR is often used on approaches to airports and sports stadiums to inform motorists of available parking facilities.

The effectiveness of a traveler information system depends on its ability to reach the widest possible traveling public. Information can be delivered through a broad range of communication channels.

- **Radio and TV broadcasts** reach a mass audience because radios are nearly universally available at home, in vehicles and in the workplace, and traffic reports are "bundled" with newscasts, talk shows and music programs that have a huge drivetime listening audience. But commercial radio and TV and cable TV offer reports only during commute hours and the reports are often sketchy because they attempt to cover an entire metro area.
- **Telephone call-in systems, kiosks, the Internet, vehicle-based navigation systems and hand-held devices** can provide traveler bulletins on demand and offer route-specific information. But access to these information sources is limited by availability of specialized equipment (cellular phones, computers, modems), and the process of obtaining the information is often time-consuming, requiring users to boot a computer, log on the Internet or navigate a menu of a telephone call-in system.
- **Variable message signs** require no action on the part of the traveler, but only reach drivers within sight distance and are limited to conveying succinct messages.
- **More advanced information delivery systems** include portable wireless communication devices (such as personal digital assistants), Radio-Data System protocols, vehicle-based navigation and guidance units and electronic message boards for transit passengers. The use of advanced traveler communication systems in the United States is still limited. In Europe and Japan, on the other hand, in-vehicle navigation devices, RDS radios and electronic passenger information systems are already widely employed. Sales of car navigation equipment have reached 250,000 units in Japan and 120,000 units in the United Kingdom. It seems likely that U.S. demand for advanced traveler communication devices will grow as the number of localities offering timely and accurate traffic information increases.



There is no single "most effective" way to communicate traveler information. Different means of communication serve different needs, and each communication technology has merits as well as limitations.



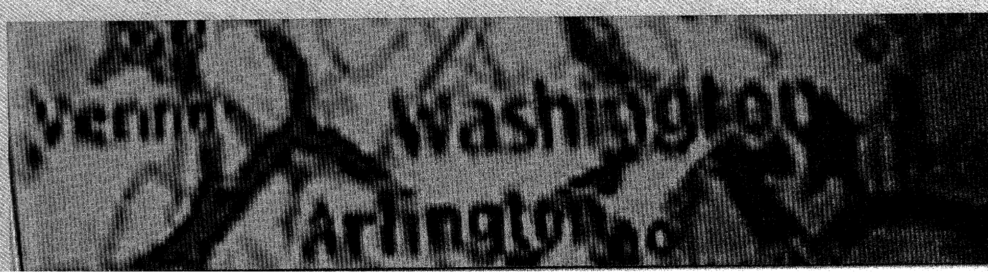
HOW TRAVELER INFORMATION INFLUENCES BEHAVIOR

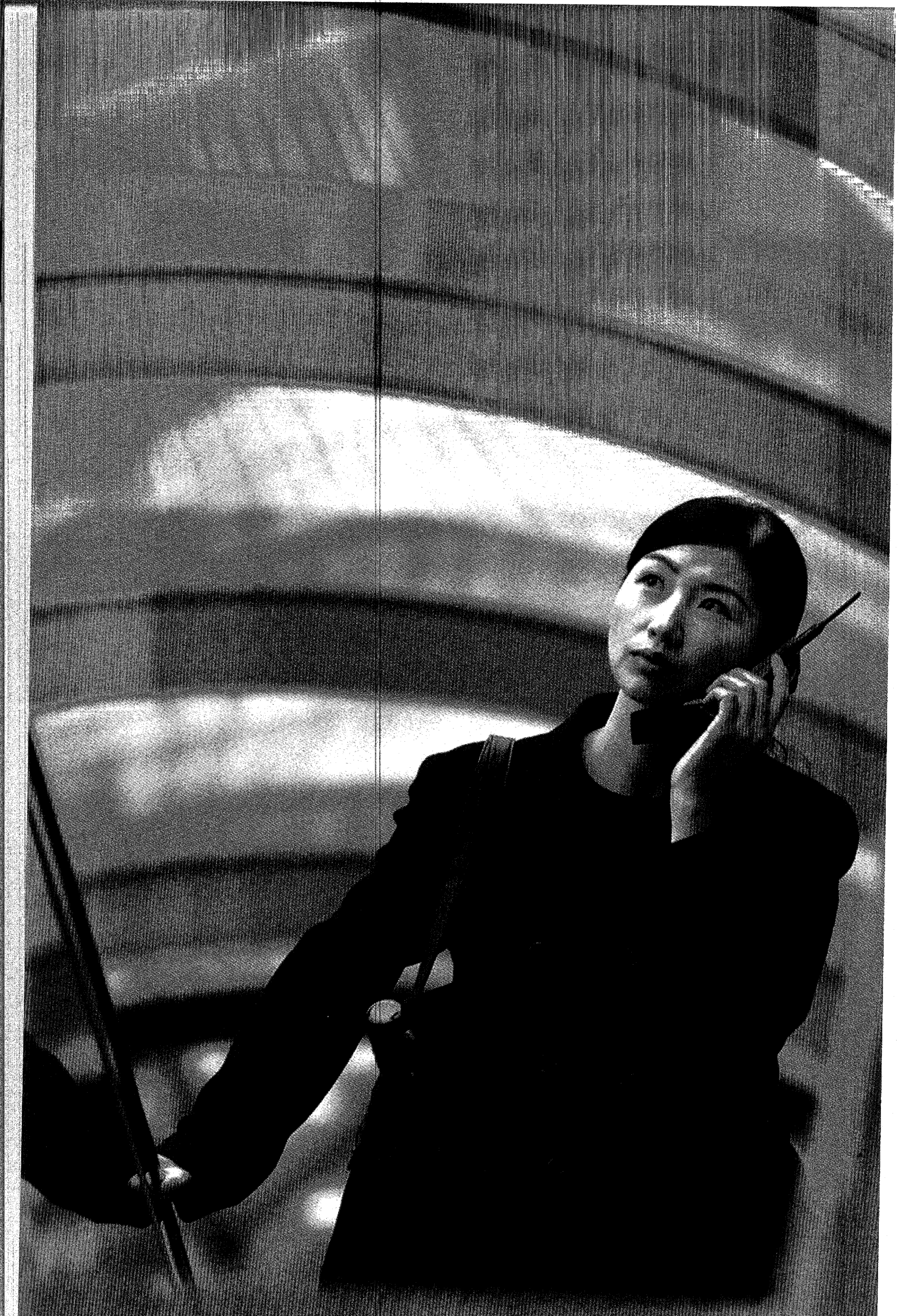
In a survey of long-distance recreational travelers in the I-95 Corridor, an average of 10 percent of travelers said they changed route, 14 percent changed time of travel and 3 percent changed their plans to travel upon hearing about traffic delays (*Market Potential for ATIS in the I-95 Northeast Corridor*, 1996). Commuters also respond to traffic reports. In a survey of 2,000 users of Boston's SmarTraveler system, 14 percent of respondents reported changing the time of departure and 12 percent reported changing their route based on a traffic report. In a survey of commuters in the Seattle area, 29 to 36 percent of respondents indicated that traffic messages frequently influence their commute choice. And a survey conducted as part of an ITS deployment planning study showed that 20 percent of the respondents would divert from their regular route if a delay of more than 15 minutes was expected.

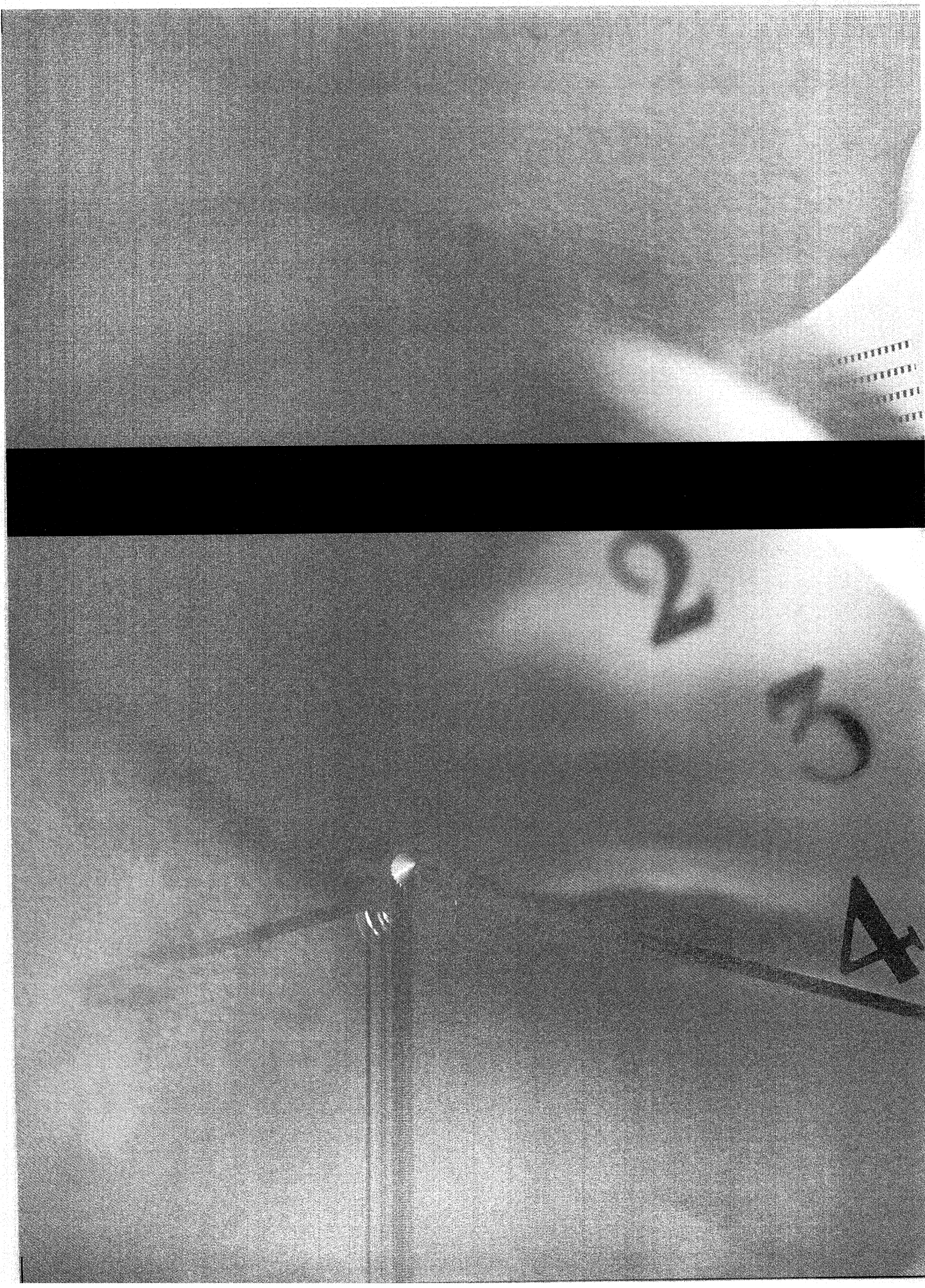
Although traveler information systems have not yet produced observable changes in overall traffic flow, traffic patterns, transit usage or congestion levels, this does not mean that commuters do not act upon the information they receive. As the use of traveler information systems increases, the cumulative effect of travelers' responses may become more noticeable.

Studies of traveler behavior suggest that the impact of traveler information may vary among different groups of users.

	Change Route	Change Time	Change Mode	Postpone Trip
Commuters	moderate	moderate	weak	weak
Fleet Operators	strong	strong	weak	weak
Tourists	strong	strong	weak	moderate
Event-goers	strong	weak	weak	weak
Intercity/Rural	strong	strong	weak	moderate



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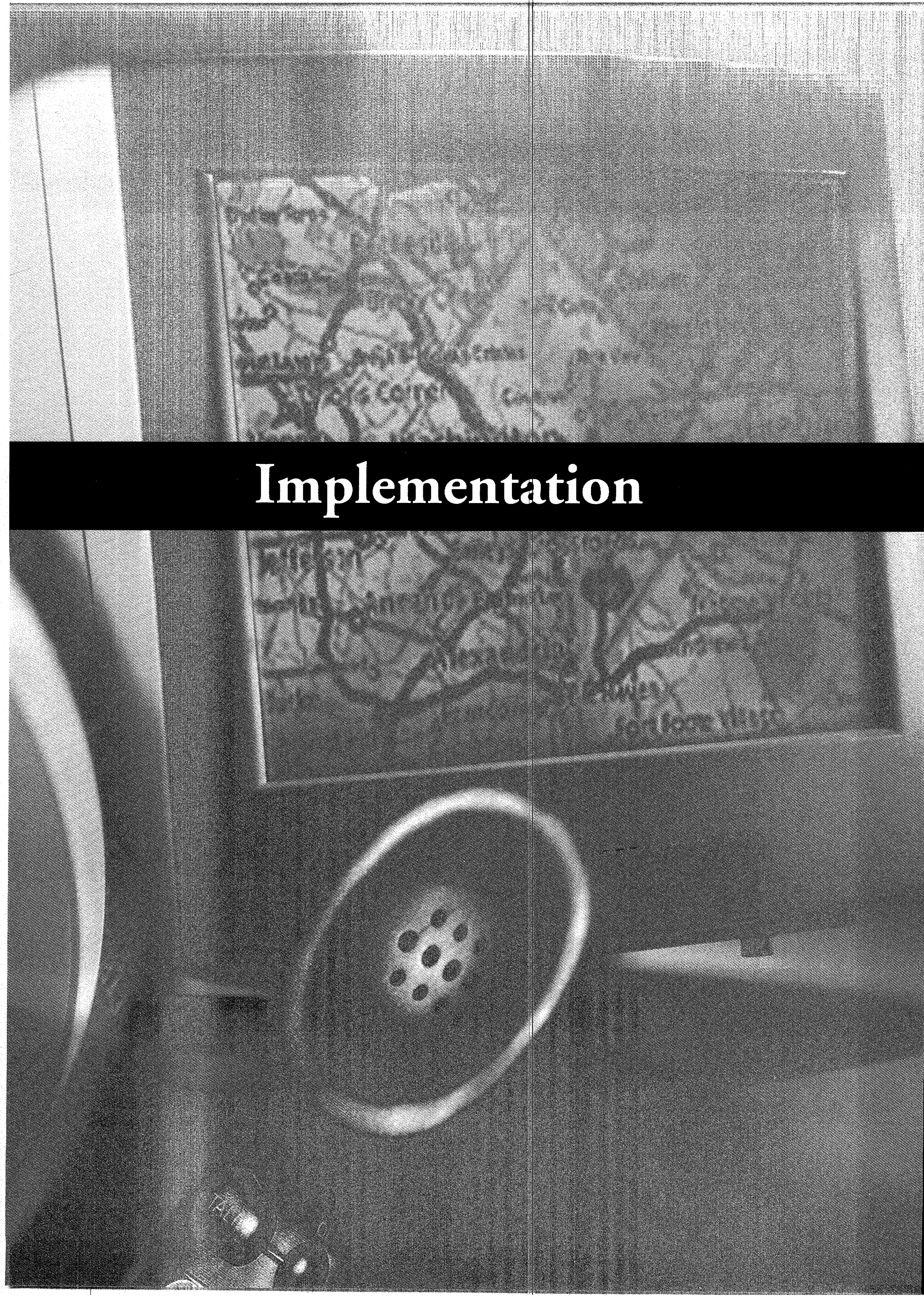
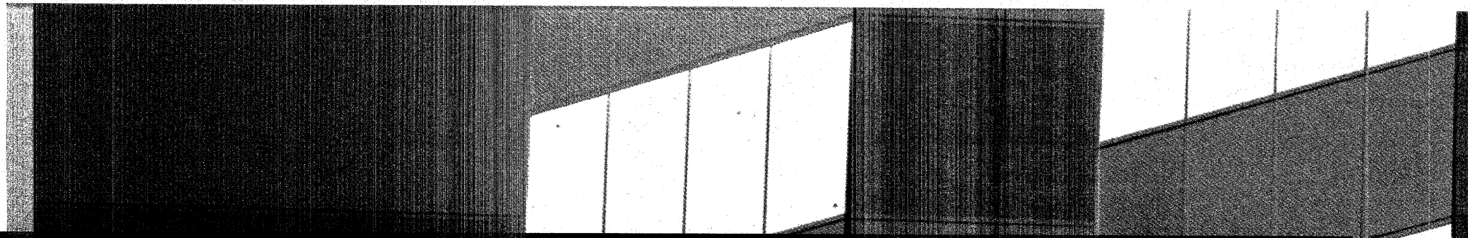


Implementation



ALTERNATIVE IMPLEMENTATION MODELS: PUBLIC, PRIVATE OR PARTNERSHIP

Precisely how the public and private sectors should cooperate has been a subject of growing discussion, as traveler information systems become a standard element of transportation management.

For many years, State and local transportation agencies have been monitoring transportation conditions and collecting data as part of their transportation and incident management responsibilities. However, until recently, they seldom shared this information with the traveling public. The job of keeping the public informed fell to private traffic reporting agencies, who established their own information collection infrastructure and began offering drivetime reports to radio and TV stations in the early 1980s.

Alternative Business Models for Traveler Information

Today, the distinction between public and private roles in the collection and dissemination of traveler information is less clear. Keeping travelers currently informed of transportation conditions is now seen as good transportation policy, and there is new recognition that data collected for transportation management purposes (and paid for with tax dollars) should be shared with the traveling public. At this time, several approaches are being actively explored. They can be classified under three headings: the public model, the commercial model and the public-private cooperation model.

In the public model, a local or State transportation agency has the exclusive responsibility for operating a traveler information system.

Some communities treat the provision of a baseline level of traveler information as a public sector responsibility. The entire system of services is offered free to the public, although this limits the amount of detail and custom-tailoring that can be offered. An example of this model is Montgomery County, Maryland, whose traveler information system includes a data collection infrastructure, a Transportation Management Center, a transit fleet monitoring system and a comprehensive information communication network, all publicly funded and operated. The information communication system consists of roadside variable message signs, highway advisory radio, kiosks in public places, telephone dial-in service, a public access cable TV channel and an Internet web site.

At the other end of the spectrum are commercial transportation reporting agencies, who possess their own data collection assets and offer traveler information services to commercial broadcasters.

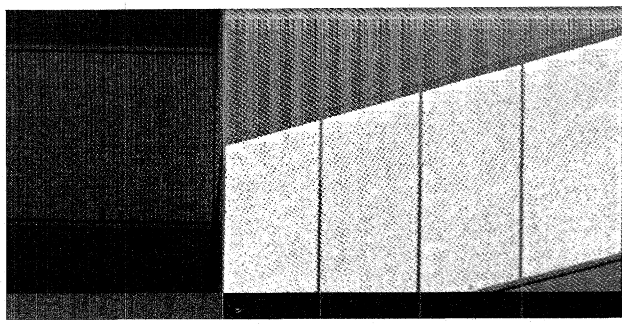
Private information providers gather traffic information with the help of airborne observers and remote video cameras. They then process the data into concise transportation bulletins and graphic displays which are transmitted to radio and TV stations where they are incorporated into "drivetime" newscasts. The reports are sold to the broadcasters or offered in exchange for embedded advertising time sold to advertisers.

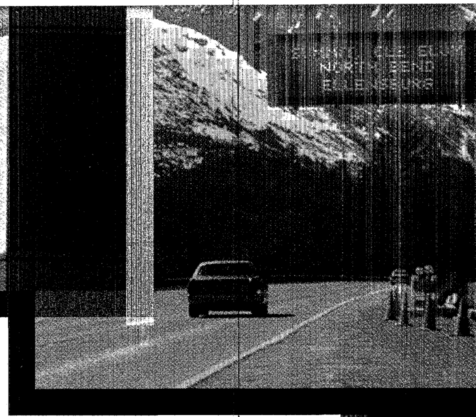
Today, privately prepared traveler information is broadcast in more than 60 U.S. metropolitan markets to an estimated audience of 100 million radio listeners and TV viewers. However, expensive airtime on commercial broadcasts limits reporting to only the most serious problems, and the nature of radio/TV broadcasting requires that the scope of the reporting be metropolitan-wide.

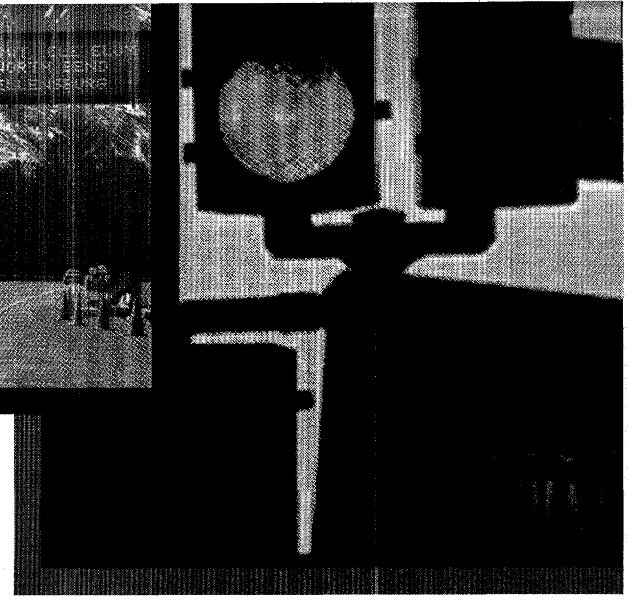
The commercial viability of personalized traveler information offered to individuals for a fee is being explored by several start-up businesses in the United States and abroad.

Cooperative relationships between the public and private sectors represents a third approach. Public-private cooperation can take various forms.

- **In the "Public-Private Partnership" model, a public agency enters into a partnership arrangement with one or more private sector organizations to institute and operate a traveler information system jointly.** The partnership typically involves joint responsibility for data collection,





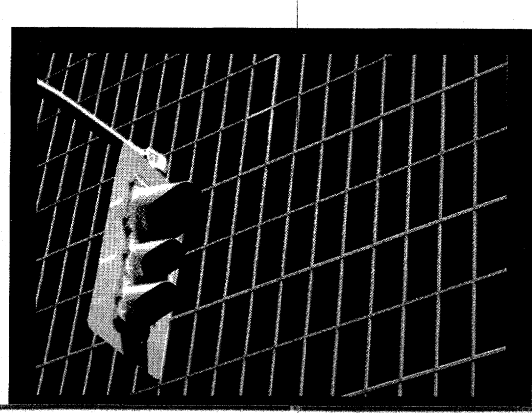


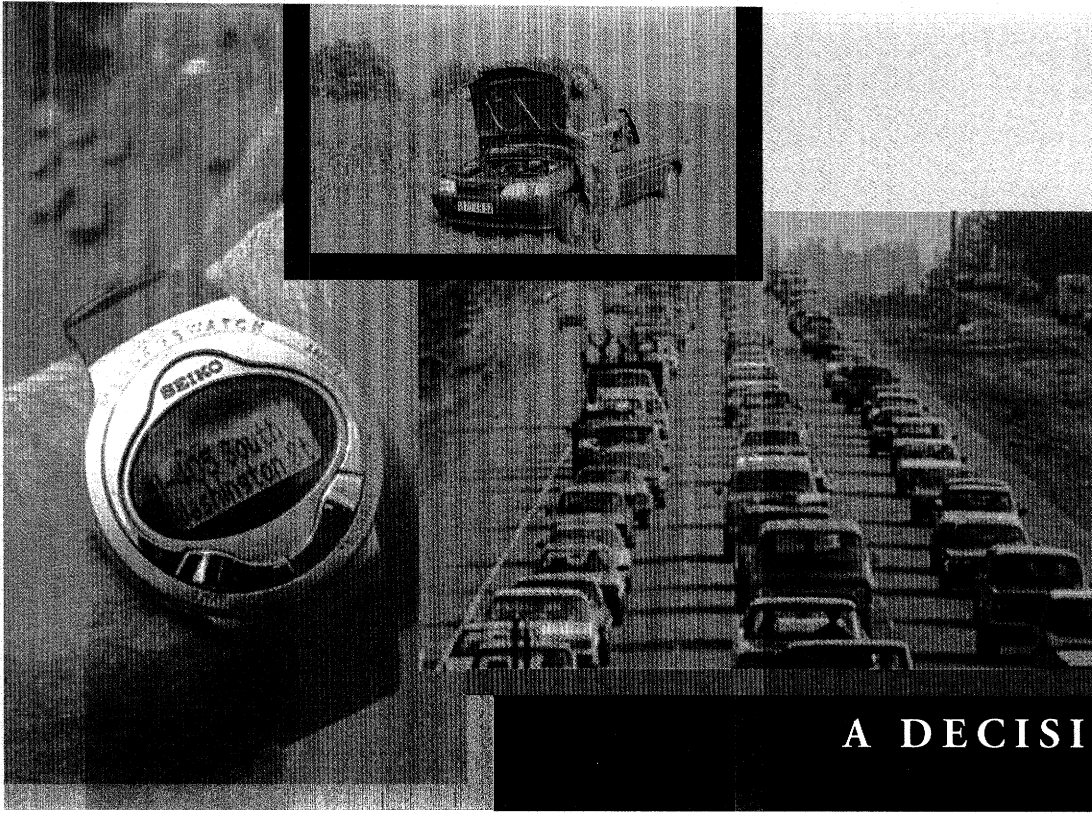
with the private partners assuming responsibility for operating a Traveler Information Center where the publicly and privately collected data is merged. This enhanced database is then offered for sale to commercial clients, such as fleet operators and specialized information service providers operating paging services and in-vehicle navigation services. The public agencies contribute raw data and retain free access to the enhanced data for transportation management purposes. An example of this type of arrangement is "Partners in Motion," a consortium of 26 public agencies and 12 private organizations that launched a regional traveler information system in metropolitan Washington, D.C. in 1997 (for a detailed description of "Partners in Motion," see *Case Studies*).

- **In the "Information Service Provider" model, transportation agencies make raw data available to private information service providers who, in turn, interpret, customize and market the data to customers.** This model is patterned after arrangements developed by the National Weather Service and commercial weather reporting services. Private information service providers obtain raw data from the transportation agencies and add value by interpreting and tailoring the data to the needs of individual clients. Just as weather reporting services provide specialized reports to the broadcasting industry, ski resorts, utility companies, airlines and agri-business, traveler information service providers hope to market customized reports to commercial trucking concerns, transportation service operators, paging services and in-vehicle information services.

- **Another potential model for traveler information services is the private franchise, as exemplified by the licensing of cable television and cellular telephone services.** In this scenario, the public sector is responsible for transportation data collection, but instead of offering the data on an unrestricted basis to all who request it, the local government awards an exclusive distribution franchise to a single competitively selected information provider in return for a fee or a share in the collected revenue. A variation on this model is the non-exclusive franchise, where two or more private information providers are given the right to serve customers in a defined service area.

- **In the "Outsourcing" model, a public agency owns the traveler information system but contracts its operation to a private firm.** This approach enables the public agency to take advantage of the marketing, management and organizational skills of private enterprise without surrendering control over the system. This option reflects the current trend to contract out (or "outsource") public functions.





A DECISION MAKER'S CHECKLIST

In the implementation of Traveler Information Systems, local governments can minimize investment costs, accelerate implementation and build successful partnerships through a range of strategies. These strategies include:

✔ Capitalizing on Existing Infrastructure

Few jurisdictions will have to start from scratch. Many already have some ITS infrastructure in place, such as fiber-optic lines, computer networks or wireless communication systems. By using existing technology and equipment to the fullest, local government can minimize the overall cost of implementing a traveler information system.

✔ Building on Existing Transportation Management Activity

Many jurisdictions already monitor transportation conditions as part of their transportation and incident management responsibilities. Chances are, local transportation and transit agencies already collect data that is needed for a traveler information system. In the past, these were thought to be only useful to transportation agencies. Today, data collected for traffic and transit management purposes can also be used to keep the public informed of current travel conditions.

✔ Developing Creative Ways of Acquiring Additional Capacity

Public rights-of-way are attractive to private telecommunication companies. Local governments can trade access to these rights-of-way for telecommunication capacity and service and use the least expensive way to acquire the required capacity. The State of Maryland, for example, started out by building its own communication network, but found that, over a 10-year life cycle, the cost to lease was half the cost of building. The money saved by leasing paid for all the planned equipment.

✔ Tapping the Potential of Wireless Telecommunications

Wireless technology can be considerably cheaper than digging trenches to hard-wire field devices such as video cameras and variable message signs. Local governments are in a good negotiating position to trade the right for private companies to locate cellular and microwave transmission facilities on public land for free wireless connections to surveillance and communication devices.

✔ Considering Commercialization

While some traveler information services may be appropriately tax-supported and offered free to the public, the more custom-tailored services may be able to generate revenue. Appropriate partnership arrangements can be considered to let government share in this revenue to offset costs and reduce public expenditures.

✔ Developing Regional Collaboration

Create seamless information service delivery across local jurisdictions through cooperation between various units of local government, the transit authority and the State department of transportation. For example, Houston TranStar, a partnership of the Texas DOT, Houston Metro, the City of Houston and Harris County, serves as an umbrella for combined traffic management, freeway operations, public transportation and emergency management. This integration creates an effective environment for a seamless, intermodal transportation network; eliminates administrative boundary constraints; and enables pooling financial, personnel and equipment resources.

Involving the Private Sector

Create opportunities to share risk and obtain skills and knowledge that some local government may not possess by bringing in private stakeholders' potential information service providers, private transportation operators, local research companies and academic institutions. For example, the San Francisco Bay Area's TravInfo project has established an Information Service Provider Forum made up of representatives from some 100 firms, institutions and public agencies. The Forum meets three times a year to discuss how best to use TravInfo data and how to effectively disseminate it to the traveling public.

Building Support Within the Community

Create a coalition of key stakeholders to develop a strategic plan for a Traveler Information System. Out of this process should emerge a vision of a Traveler Information System and a set of goals and objectives that has the active support of the community.

Assessing Public Costs and Identify Funding Sources

Estimate the financial needs and ascertain financial options, both public and private. Consider all available sources of Federal funds, such as ITS program funds or Federal-aid highway funds, and other sources such as State infrastructure banks, revenue from leasing public right-of-way to telecommunications companies, and creative revenue sharing arrangements with the private sector. For example, San Francisco's TravInfo project has set up a Business Plan Working Group to examine revenue generation opportunities involving public and private sources, and to develop a financial plan.

Generating Visibility, "Early Winners" and Problem-Driven Rationale

Use an event that underscores the need for a Traveler Information System and capitalize on its ability to solve a perceived problem. For example, the city of Atlanta and the State of Georgia recognized the need for a regional traveler information system to deal with the influx of visitors to Atlanta during the 1996 Summer Olympics. They also saw the value of the Olympics as a catalyst for the traveler information system and a rationale for the necessary infrastructure investment. The visibility of the Olympics made the initiative a natural candidate for a "Traveler Information Showcase." The success of the system in managing transportation demand during the Olympics was, in turn, used to institutionalize the system as a permanent part of Atlanta's transportation management infrastructure.

Some Final Counsel:

Improve the quality of the transportation database.

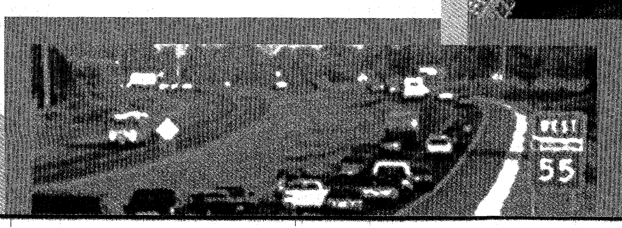
This will have multiple rewards, since good data not only enhances traveler information but also improves the transportation management and emergency response capability of the local jurisdiction.

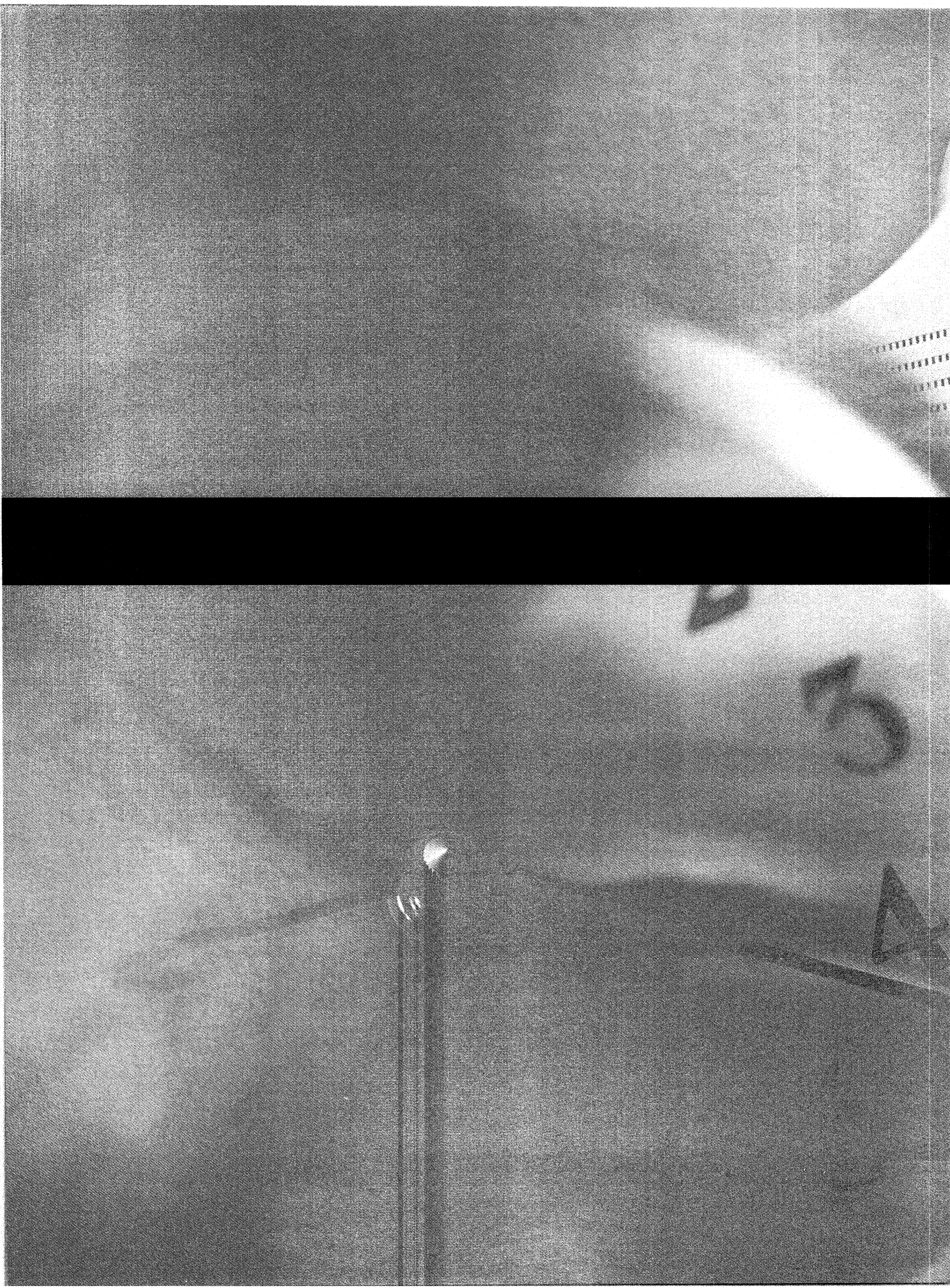
Consider offering a baseline of traveler information services to the public on a free basis.

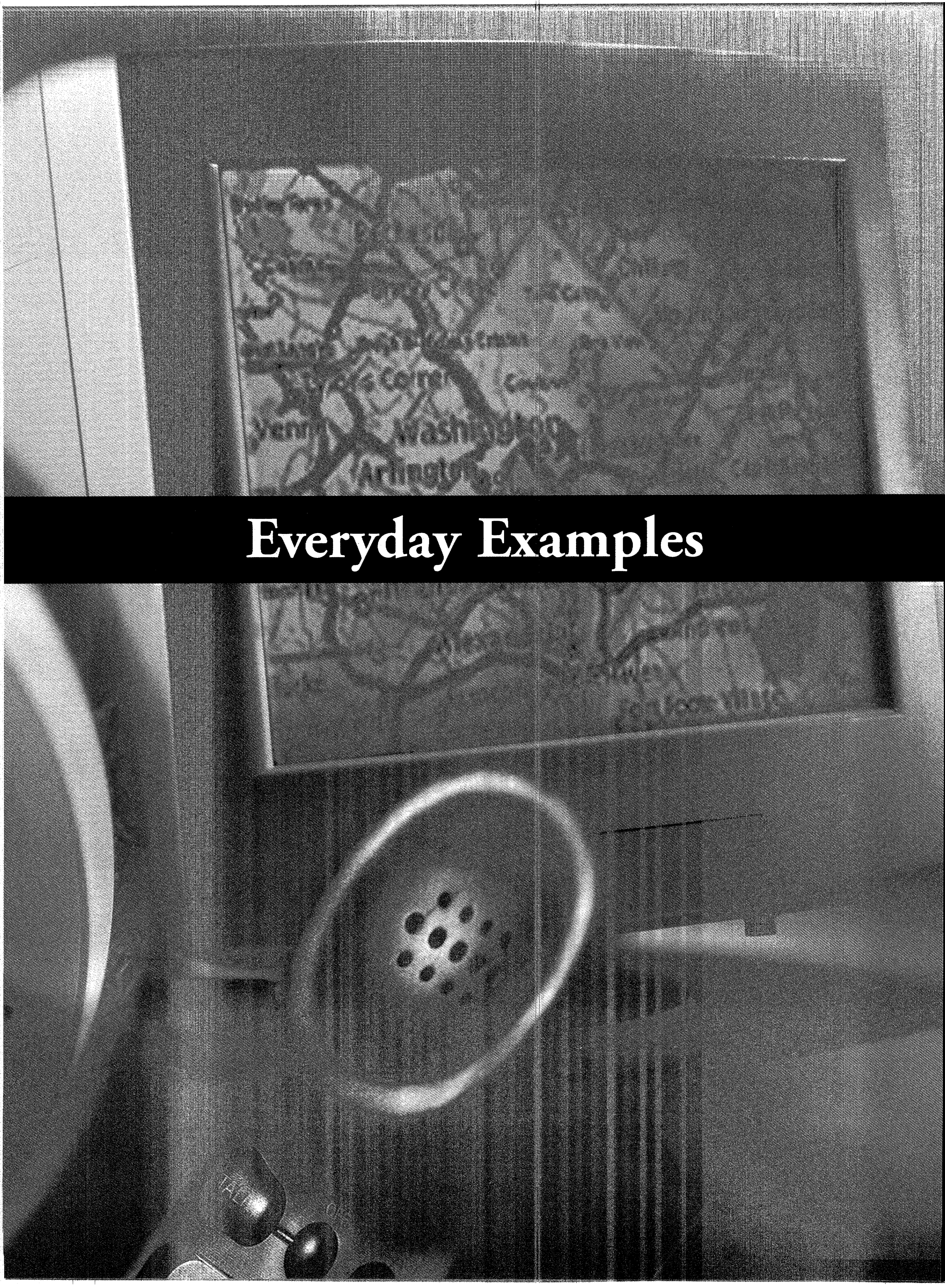
This may be appropriate when the data has been collected at taxpayers' expense.

Clearly define public and private sector roles and responsibilities.

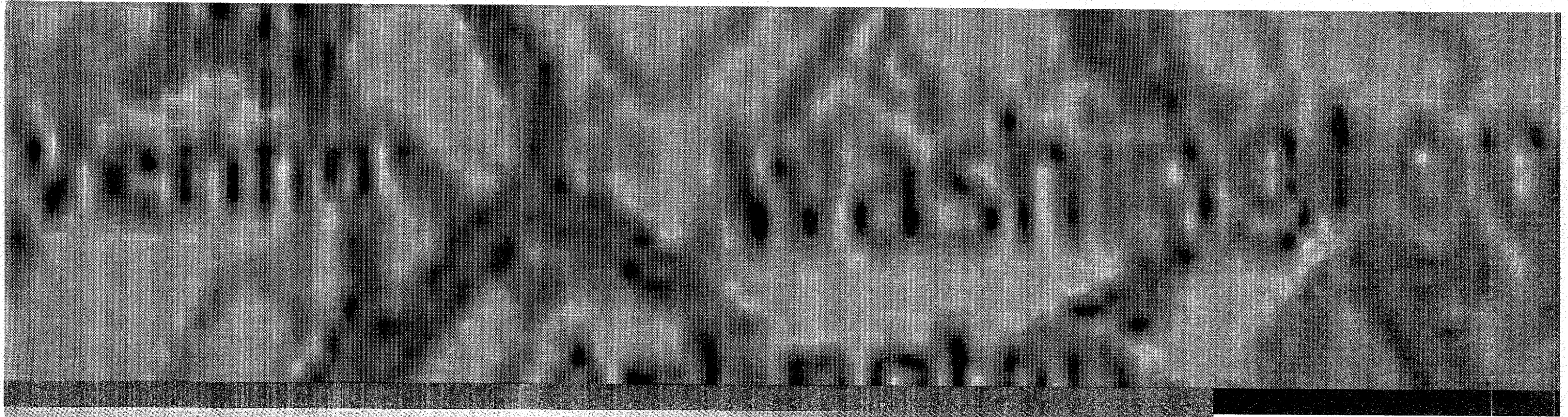
As part of improved management and operations of their transportation facilities and services, public agencies should focus on their core mission — data gathering and development of a data collection infrastructure. The private sector is well equipped to enhance the content and provide personalized traveler information services to paying customers.

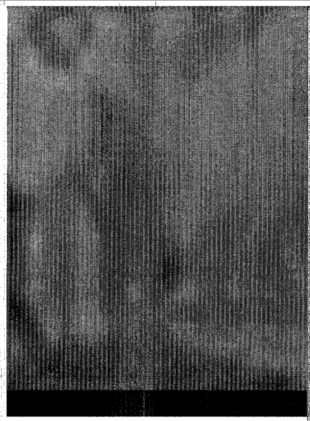


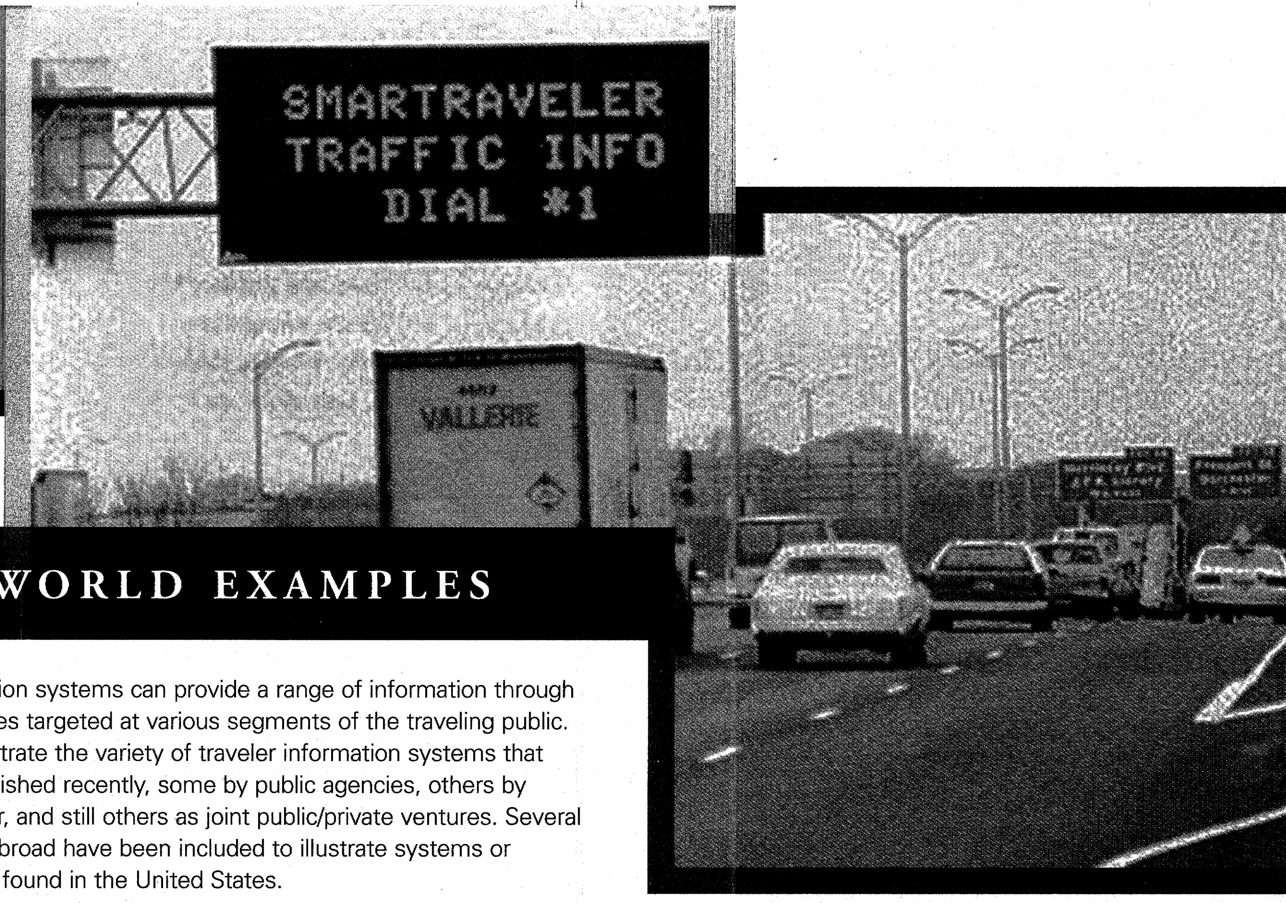




Everyday Examples



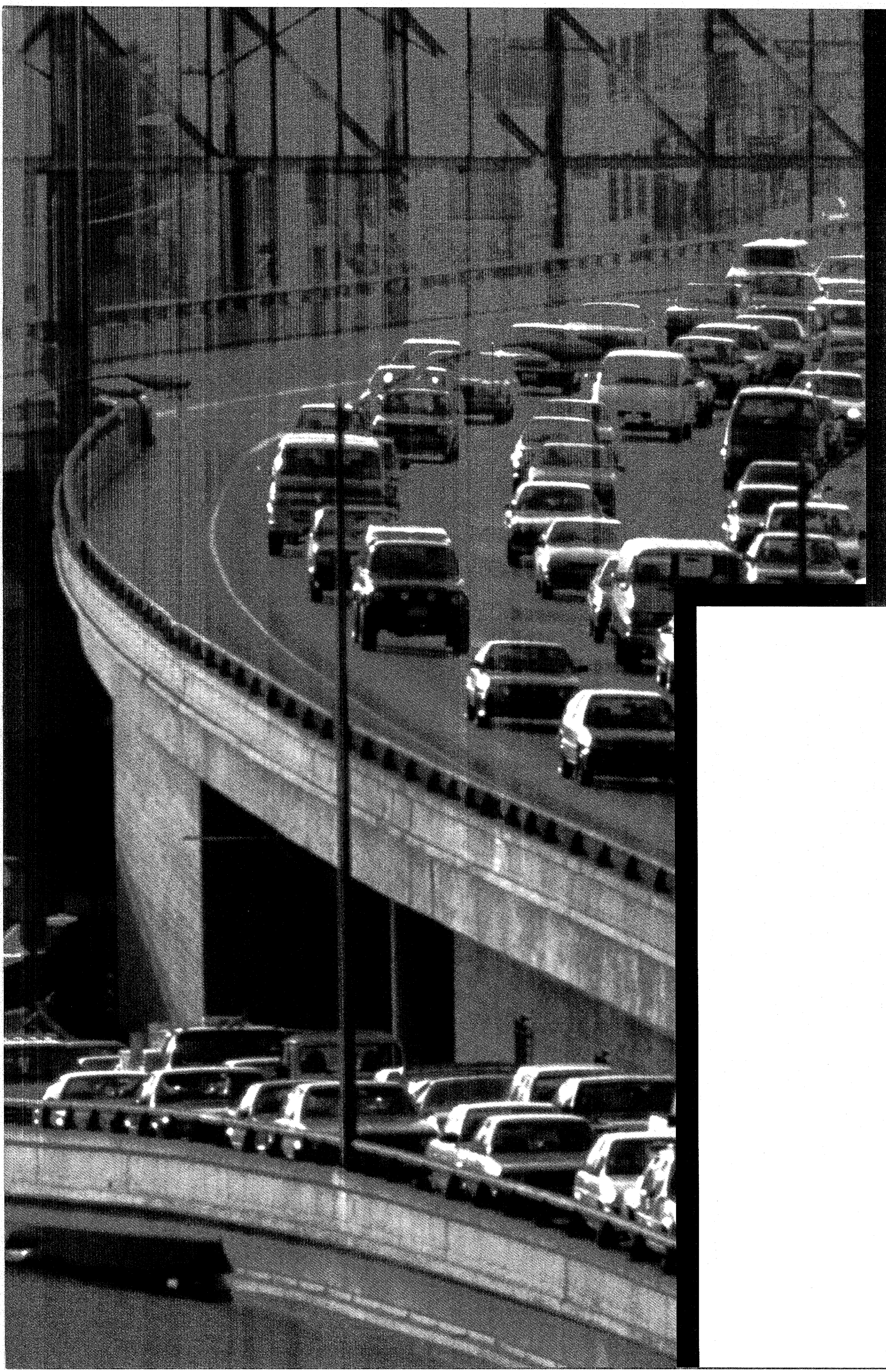




REAL WORLD EXAMPLES

Traveler information systems can provide a range of information through many technologies targeted at various segments of the traveling public. These cases illustrate the variety of traveler information systems that have been established recently, some by public agencies, others by the private sector, and still others as joint public/private ventures. Several examples from abroad have been included to illustrate systems or technologies not found in the United States.

	Purpose/Scope	Name	Location	Sponsorship
1	Metropolitan-Wide Service	Smart Trek	Seattle, WA	Public
2	Inter-Regional System	Travel	New York Metro Area	Public
3	Rural, Tourist Information System	YATI	Yosemite Park, CA	Public
4	Parking Information System	Orion	St. Paul, MN	Public
5	County-Operated System	Montgomery ATIS	Montgomery Co., MD	Public
6	Metropolitan-Wide Service	Partners in Motion	Washington, D.C.	Public/Private
7	In-Vehicle Information and Safety	OnStar	Nationwide Network	Private
8	Private Traveler Information Service	Etak-Metro Networks	Nationwide	Private
9	Private Traveler Information Service	SmarTraveler	Eight U.S. Cities	Private
10	Nationwide Inter-City System	Trafficmaster	United Kingdom	Private
11	In-Vehicle Information System	VICS	Tokyo, Japan	Public/Private
12	Transit Passenger Information	Infobus Project Countdown	Paris, France London, U.K.	Public Public



EXAMPLE #1

PURPOSE/SCOPE: Metropolitan-Wide Traveler Information Service
NAME: Smart Trek
LOCATION: Seattle, Washington
OWNER/OPERATOR: Washington State Department of Transportation (WSDOT)

The goal of Seattle's Smart Trek is to increase public acceptance and awareness of intelligent transportation technology and demonstrate its cost-effectiveness and travel time reduction benefits. The Smart Trek Model Deployment Initiative builds on both the Seattle region's substantial existing investment in intelligent transportation infrastructure and its record of successful partnering with the private sector.

UNIQUE FEATURES:

At the core of the region's traveler information outreach is an integrated information "ITS Backbone." Public agencies — led by WSDOT — provide the basic information that supports congestion maps, incident bulletins, construction closure information, and freeway video image snap shots as well as transit, Amtrak, and the State Ferry System data. In addition, several private information service providers add their own data as part of services they provide directly to customers. This backbone provides the basis for an expanding range of public and commercial traveler information services

MODE OF OPERATION:

Traffic surveillance has been practiced in the Seattle region as part of traffic management for many years. Starting in the mid 1970s, WSDOT has equipped more and more of the regional freeway network with closed circuit television cameras (CCTV) and traffic detectors imbedded in the pavement. The existing infrastructure has been expanded through installation of additional freeway and arterial traffic monitoring equipment.

In the early 1980s, a series of variable message signs were installed to alert motorists of traffic conditions immediately ahead, such as severe congestion, incidents, construction activities, and special events. Completing the first generation information system was a telephone call-in system providing recorded traffic bulletins. As cellular phones became more popular in the late 1980s, the use of phones by Smart Trek increased, both to receive notification of problems and to provide traffic condition information.

The existing information distribution system has been enhanced through expansion and addition of new information delivery systems. These include an Internet web site; passenger information displays at transit stations; expanded use of variable message signs; rest stop kiosks and roadside advisory radio; a university-sponsored cable TV Traffic Channel; parking information and guidance system at major cultural and sports facilities; and customized data "packages" for pagers, hand-held computers, message watches, and in-vehicle navigation devices. In addition to these features, a range of service providers use WSDOT information to provide specialized services like transit ridematching.

INSTITUTIONAL ARRANGEMENTS:

Seattle's Smart Trek capitalizes on major investments — public and private — that have been made in the last 20 years to gather and distribute traveler information. WSDOT and King County Metro have invested in the "backbone" of basic information — aided by a Federal "model deployment" grant. This information is made available free of charge on the Internet, cable television, and through news outlets. Private companies can retrieve this information, customize it, and re-sell it in specialized formats to consumers. Overall, this partnership provides a wide array of benefits. Consumers can receive a wide variety of information, both basic and customized, while public agencies receive enhanced traffic information from private data sources to improve their operations. New markets are opening with new services providing both information and safety benefits.

EXAMPLE #2

PURPOSE/SCOPE: Inter-regional Multimodal Traveler Information System
NAME: iTravel
LOCATION: New York/New Jersey/Connecticut
OWNER/OPERATOR: TRANSCOM

The primary goal of iTravel is to provide one-stop shopping for real-time, multi-modal, surface transportation information for travelers in the 29-county New York City metropolitan region covering northern New Jersey, southern New York and southern Connecticut.

UNIQUE FEATURES:

iTravel is unique in its wide coverage of a metropolitan area that extends across 29 counties in three states, and in its heavy transit orientation. TRANSCOM — an existing coalition of public highway and transit agencies — owns and operates iTravel.

The major components of iTravel include enhancements to the TRANSCOM travel data collection and development system, creation of a Traveler Information Center (TIC), a regional Transit Itinerary Planning System (TRIPS) to support transit trip making and a Personalized Traveler Service (PTS) operated by private-service providers. The various iTravel components will provide basic highway and transit travel information free of charge, and personalized travel information and notification for a fee.

MODE OF OPERATION:

TRANSCOM's regional data development and communication systems coordinate and integrate advanced transportation management and information systems being implemented by the 14 member agencies. TRANSCOM's database will serve as the primary source of information for the TIC and PTS components and will also connect with TRIPS.

Data collection is being improved through the use of Transmit, an automatic vehicle identification technology based on roadside readers that monitor in-vehicle electronic "tags" and detect slowdowns or incidents. This data on speed and travel time not only improves traffic monitoring, it helps identify chronic "bottleneck" areas, determine the level of staffing required at area toll booths, and increases agencies' understanding of how their systems operate on an hourly or daily basis.

Roadway travel conditions information together with transit schedule and fare information and transit trip itineraries will be available free of charge via the iTravel telephone and web site. The fee-based PTS services will automatically notify customers of problems on their predesignated routes, using a range of media including telephone, alphanumeric messaging devices, faxes, and e-mail.

INSTITUTIONAL ARRANGEMENTS:

The various New York/New Jersey/Connecticut area agencies first established TRANSCOM in 1980 to share information about each other's construction-related lane closures. The arrangement developed into a formal alliance to exchange information on incidents, road conditions and special events affecting traffic. With a staff of 30, TRANSCOM has become an extensive traffic and transit information sharing system for more than 100 public agencies in the tri-state region. A consortium of private sector system integration and service provider companies has joined with TRANSCOM to develop and operate iTravel for five years. A key aspect of this arrangement is to test the commercial viability of traveler information services in the nation's largest transit market.

EXAMPLE #3

PURPOSE/SCOPE: Rural Tourist Information Service
NAME: Yosemite Area Traveler Information (YATI)
LOCATION: Yosemite National Park Area, California
OWNER/OPERATOR: Merced County Association of Governments (MCAG)

Mariposa County, California officials deployed YATI as a tool to manage traffic in and around Yosemite National Park. The heavy use of park facilities and access routes and the range of destination and tourist service opportunities suggested an opportunity to improve the visitor experience and support the tourism industry. YATI uses ITS technology to provide Yosemite-bound travelers with information about current weather and travel conditions; the availability of parking, lodging and camping facilities in and around the park; travel modes and routes to the park; and park events.

UNIQUE FEATURES:

YATI provides travelers with information and choices about both destination and travel conditions. For example, if weather prohibits travelers from taking a certain route due to snow or other dangerous conditions, the system will suggest alternate routes. YATI contains complete information about road and weather conditions in the area.

Besides traffic and weather information, YATI contains current information on the status of the park and occupancy of area hotels and campgrounds. Peak-season visitation can force the Park Service to close certain entrances, and campgrounds and hotels can be similarly affected during these periods. YATI is available to forewarn travelers with such information so that they can make alternate destination and lodging arrangements.

MODE OF OPERATION:

YATI is an Internet-based system of traffic and traveler information derived from a variety of sources. Caltrans provides traffic information on major State routes leading to the park area. The U.S. National Park Service provides traffic information for roads within the park, and five surrounding counties supplement this with their own road information. Weather information comes from the University of California. Visitors' bureaus, campgrounds, wineries and local businesses similarly provide a wide array of tourist destination information.

YATI serves as a clearinghouse for these disparate data sources, mostly through links to the Internet sites of other agencies and businesses. Information is "real-time" only to the extent that the sources keep their data current. MCAG does not directly control the highway advisory radio and changeable message signs, so changes in the status of park traffic or occupancy are transmitted by the Park Service to MCAG, which then communicates with Caltrans to change sign and radio messages.

YATI uses a variety of communication channels, including kiosks with interactive terminals at visitor centers; Caltrans' changeable message signs and highway advisory radio; and the Internet.

INSTITUTIONAL ARRANGEMENTS:

Private citizens, local officials, and business owners initiated the project, suggesting the services and locations for YATI data centers. Caltrans funded YATI as an operational test of ITS technology, with the Merced County Association of Governments providing project management. One goal of the project is to become self-sustaining through the sale of advertising space on the Internet site.

MCAG staff maintains the Internet site and works with Caltrans officials to update the roadside radio and message sign operations. The YATI Management Board is made up of voting representatives from Yosemite National Park, local counties, and regional planning agencies plus "ex-officio" representatives from public agencies.

EXAMPLE #4

PURPOSE/SCOPE: **Parking Information System**
NAME: **St. Paul Advanced Parking Information System**
LOCATION: **St. Paul, Minnesota**
OWNER/OPERATOR: **City of St. Paul, Minnesota**

The St. Paul parking information system provides motorists with accurate, continuously updated information about availability and occupancy status of parking facilities. This allows motorists to select in advance the most convenient parking location. Advanced parking information systems help to reduce congestion, air pollution and fuel consumption by minimizing the search for parking.

UNIQUE FEATURES:

Downtown St. Paul receives more than four million visitors annually, attracted by the State capitol and by events at the Civic Center and a variety of cultural institutions. With this many visitors, many of whom are unfamiliar with city streets and parking facilities, there is a need to efficiently guide motorists to available parking spaces. The project involves providing real-time space availability to motorists for seven parking garages and three surface parking lots, either publicly or privately owned.

Real-time space availability is communicated to motorists via a system of uniform color-coded guide signs placed on the approach to the Civic Center at key intersections. The signs display the number of available parking spaces in each of the parking facilities ahead. Color-coded static wayfinder signs complement the electronic variable message signs to guide motorists to each parking facility. A static sign of the same design signals entrance to each facility.

The system distributes available parking evenly among arriving motorists by feeding information to motorists when they enter the "perimeter of information" in the central business district. They then receive direction to the most appropriate parking facility through real-time displays of the number of spaces available.

MODE OF OPERATION:

Creation of the St. Paul Advanced Parking Information System involved the installation of ten variable electronic message signs with a large number of static directional signs. The directional signs are strategically placed along the streets leading into the downtown area. Once in the central business district, motorists receive information from the variable message signs, which also provide direction to distribute motorists to available parking facilities.

Communication between parking facilities and the central computer is direct-wired. The variable message signs are equipped with radio communication to a central computer, which provides updated parking availability data.

INSTITUTIONAL ARRANGEMENTS:

The City of St. Paul facilitated the implementation and evaluation of the project to demonstrate a practical means of extending Minnesota Guidestar, MnDOT's Intelligent Transportation System program, beyond the transit and roadway components of the travel system. With an extensive traveler information system in place, the St. Paul project sought to include management of trip destinations and the parking component of the total travel system involving both private and public parking facilities. Federal, State, and local governments, as well as a manufacturer of variable message signs, contributed funding for the project.

EXAMPLE #5

PURPOSE/SCOPE: County-Operated System
NAME: Montgomery County ATIS
LOCATION: Montgomery County, Maryland
OWNER/OPERATOR: Montgomery County Department of Public Works and Transportation

Montgomery County, Maryland — with a population of 810,000, 3,000 miles of roadways and its own transit system — is a major suburban county in the Washington, D.C. metropolitan area. To confront growing suburban travel demands — from both local and "through" traffic — and the resulting congestion, the County embarked upon its own ambitious local government program of transportation management using state-of-the-art technologies of traffic surveillance, signal control, incident detection, transit fleet management and traveler information.

UNIQUE FEATURES:

The County's system is targeted on the needs of its residents and travelers providing information on traffic during morning and evening rush hours with notices of delays, incidents and road construction. This coverage is expanded during snow and other emergencies to provide immediate information about County closings, program changes, snow removal and other emergency efforts. In the event of road closures, the system provides recommended detours. The system is intermodal, providing information about public transit schedules, routes and fares.

Numerous media are used to disseminate traveler information collected by the County's Advanced Transportation Management System. More than 170,000 households subscribe to Montgomery County's public access channel, receiving real-time traveler information including live video feeds. A roadside advisory radio system covers approximately 10 percent of Montgomery County with 12 low-wattage transmitters using 590AM or 1070AM frequencies.

Variable message signs are used to alert motorists of incidents, lane closures, congestion and road conditions ahead. Future uses of the signs will include information about parking availability at park-and-ride lots and trailblazing signs for construction detours and incident re-routing guidance.

A "Traveler Advisory Telephone System," designed primarily for use in emergencies and adverse weather conditions, provides recorded messages about government and school closings, road conditions, and public transit service. The county also has an Internet site, and there are plans underway to develop traveler information kiosks at key locations such as shopping malls, transit stations and major employment sites.

MODE OF OPERATION:

Traveler information is a byproduct of the County's extensive traffic control and transportation management activities. Integrated devices include traffic signals, detection systems, variable message signs, video surveillance cameras and radio broadcast advisory systems.

The County is currently installing a fiber optic network as an enhancement to the existing 300-mile copper wire network. The fiber optic network integrates all public communications requirements, providing cost-effective, countywide connectivity, consolidating and integrating numerous distinct telecommunications initiatives of several individual county agencies and departments.

INSTITUTIONAL ARRANGEMENTS:

Since the system is County-based, coordination and integration of data among agencies is greatly simplified. The County has been integrating a computerized signal system for the past 17 years and aggressively shares data with users through an "open" architecture design. In 1996, Montgomery County began integrated traffic and transit operations. As part of a joint project with the U.S. DOT and the Maryland Department of Transportation, the County began equipping its buses with the latest in automated vehicle locating technology. Vehicle tracking will be integrated with the traffic signal control system to provide priority treatment for buses.

EXAMPLE #6

PURPOSE/SCOPE: Metropolitan-Wide Traveler Information Service
NAME: Partners in Motion
LOCATION: Metropolitan Washington, D.C.
OWNER/OPERATOR: Public-Private Consortium, with the Virginia Department of Transportation as Lead Contract Agency

The Washington, D.C. metropolitan area, consisting of the District of Columbia and suburban Virginia and Maryland, has a population of 4 million and ranks second in the nation in the intensity of traffic congestion and length of commute times (average of 29 minutes one way). With a projected growth in regional employment of 43 percent by 2020, commuting is likely to get worse. The State and local governments in the region operate several roadway and transit systems. The information system provides route-specific transportation information and transit and carpooling information to the public via the Internet and a dial-up telephone system.

UNIQUE FEATURES:

Partners in Motion is unique in its coordination of public and private entities formed to address regional traveler information challenges. It is a consortium of 25 public agencies and 12 private organizations that entered into an arrangement to establish a regional traveler information system. Virginia DOT assumed the lead as the contracting agency, entering into an agreement with a cost-sharing private partner to set up and operate the service.

MODE OF OPERATION:

Most of the participating agencies have some form of data collection for their systems. Collection methodology runs from simple to sophisticated and from small-area to wide-area coverage. The three DOTs and the area transit agency all operate at least one Transportation Management Center and use various detection methods and communications media. The private partner, SmartRoute Systems, also gathers traffic data.

SmartRoute built and operates a traveler information center to gather and disseminate traveler information. Initially, they will receive information from public agencies by telephone or facsimile, with a transition to electronic data transfer over time. They will also provide the telephone-based audiotext system and a web page free to the public for the duration of the project. Current plans for dissemination include cable TV, personal paging, in-vehicle devices, personal digital assistants and kiosks.

The Internet site and audiotext systems provide route-specific information as well as transit and carpooling information. By clicking on a particular road segment on the web site or entering the code of a road segment on a touch-tone telephone, travelers obtain timely reports on traffic conditions for the specified segment.

INSTITUTIONAL ARRANGEMENTS:

SmartRoute Systems (the private partner) set up the traveler information center at its own expense, cost-sharing with the public sector in anticipation of developing a fee-based market for travel information on a self-sustaining basis after a three-year period of public support. SmartRoute will continue to operate the center as a business on a permanent basis and will retain ownership rights in the enhanced database. The participating public agencies have agreed to provide transportation data for their respective jurisdictions and have the right to use the enhanced data at no cost for their own purposes. When the project becomes self-sustaining, 10 percent of the gross revenue will be returned to the public sector.

EXAMPLE #7

PURPOSE/SCOPE: In-Vehicle Traveler Information and Safety System
NAME: OnStar
LOCATION: Available on High-End General Motors Automobiles Operating in North America
OWNER/OPERATOR: General Motors

OnStar provides a range of information-based, security-oriented services. Customer focus groups convened by GM showed that safety and security, followed closely by travel-related services, are what car buyers want most out of new communication technology. OnStar is designed with those objectives in mind. Its cellular phone and on-board advanced vehicle electronics, combined with Global Positioning System (GPS) satellite technology, link the driver to the OnStar Center where skilled operators can instantly locate the car and respond to any number of emergencies. A similar service is offered by Ford through its RESCU program.

UNIQUE FEATURES:

OnStar is a comprehensive safety and traveler assistance service. When an airbag deploys, the service automatically notifies the OnStar Center. An operator can check on the occupants' conditions and alert the local 911 emergency service response entity or dispatch an ambulance or towing truck to the crash. The OnStar system also detects an unauthorized entry into the vehicle and, through GPS, tracks the stolen vehicle and directs the police to intercept it.

OnStar's computer is fully integrated with the diagnostic components of the automobile. Subscribers can get immediate remote diagnostics of the vehicle's engine, transmission, and brake system if a warning light flashes on the car's instrument panel.

Drivers who cannot find their cars in a large parking lot can call the OnStar Center, which will activate the car's horn and flash its lights on command. Similarly, if the car owner is locked out, the center can issue a remote command to unlock the doors.

Beyond its safety and security features, OnStar is also capable of a wide range of traveler assistance services. OnStar Center advisors can provide verbal turn-by-turn route directions to client-designated destinations. The advisors also can assist subscribers in hundreds of other ways, from locating the nearest open gasoline station or pharmacy in the middle of the night, to making hotel and restaurant reservations and purchasing theater tickets.

MODE OF OPERATION:

OnStar uses GPS and a hands-free, voice-activated telephone to link the driver and the vehicle with the OnStar Center. The system is fully integrated with the vehicle's electronics and diagnostics system, allowing emergency detection (e.g., if an airbag deploys) and on-demand vehicle monitoring. Through the cellular telephone, customers can call an OnStar advisor to receive personalized traveler assistance for service support.

INSTITUTIONAL ARRANGEMENTS:

Since September 1996, purchasers of GM's luxury line of cars have been able to equip their cars with an OnStar system. OnStar is operated from a central location, 24-hours-a-day. Originally available only on luxury cars, OnStar service is being progressively extended to GM's fleet of premium and mid-size sedans, minivans, sport utilities, and full-size trucks. SAAB will offer the OnStar system on some of its 1999 model year automobiles.

EXAMPLE #8

PURPOSE/SCOPE: Private Traveler Information Infrastructure
NAME: Etak-Metro Traffic Data Network
LOCATION: Major Metropolitan Markets
OWNER/OPERATOR: An Alliance of Etak Inc. and Metro Networks

Etak and Metro Networks are implementing a private sector initiative to provide an ATIS infrastructure that, by the year 2000, will make real-time traveler information available in more than 75 major metropolitan areas throughout the United States in a variety of standard and special formats.

UNIQUE FEATURES:

The aim of the Etak-Metro Networks alliance is to provide traveler information for all the major metropolitan areas as the basis for supporting a range of services and products that require consistent nationwide coverage. The market focus is prospective providers of ATIS products who consider real-time traveler information to be an essential element of their products and desire nationally uniform, real-time traveler information for products that must work on a nationwide — rather than a regional — basis. The Etak-Metro Networks strategic alliance overcomes these barriers by fusing regional data into central databases in a common format that can be accessed by a variety of service providers. This infrastructure creates a database of real-time traffic and traveler information that can be used by licensees in a variety of formats for any number of mobile and fixed devices.

MODE OF OPERATION:

Metro Traffic has an established presence in all major U.S. markets, using air and ground surveillance to broadcast live traffic reports on radio and television news segments. The blending of Etak Traffic WorkStations with the Metro Networks information base creates a national ATIS infrastructure by providing a common format for the regional traffic information systems and communications systems, products, and services that they support. Traffic and travel data from a range of outside sources is input automatically or manually by operators and relayed to Metro and Etak headquarters from which it can be supplied to licensees in an appropriate format. Delivery options include automotive navigation systems, fixed PCs, portable PCs, hand-held PCs, pagers, telephones, cellular phones, kiosks, radios and televisions.

INSTITUTIONAL ARRANGEMENTS:

The Etak-Metro Networks alliance uses partnerships for both data gathering and dissemination. Metro Traffic can capitalize on a range of public and private data sources already established in their markets. Data from Etak and Metro Networks is then licensed to any number and type of traveler information retailers. For example, the two companies provide real-time traffic data to cable television channels in Tempe, Arizona, and Atlanta, Georgia, as part of the model deployment initiatives and will support Seiko pager watches in Seattle, kiosks in Arizona, as well as web pages, portable PCs, cell phones and mobile devices in both locations.

Etak plans to offer a base level of traffic information that will be part of AT&T's PocketNet phone. Phone subscribers can then opt for an enhanced service, Traffic Angel, which will allow them to customize the information and be automatically called with updates of changes in travel conditions on their routes.

EXAMPLE #9

PURPOSE/SCOPE: **Private Traveler Information Services**
NAME: **SmarTraveler Information Services**
LOCATION: **Eight U.S. Cities**
OWNER/OPERATOR: **SmartRoute Systems, Inc.**

SmartRoute Systems, Inc. is a privately held company focused on the collection, management and dissemination of advanced traveler information in partnership with public agencies as well as private clients. SmartRoute bills itself as an information wholesaler designed to gather information from a variety of public and private sources and deal with other network service providers and retailers that sell directly to the traveling public. SmartRoute is currently involved in eight projects in the United States: Boston, Bridgeport, Philadelphia, Washington D.C., Cincinnati, Colorado, Detroit and Minnesota.

UNIQUE FEATURES:

SmartRoute Systems enters into partnerships with public agencies to provide advanced traveler information services branded under the name, SmarTraveler. Installations are typically built around an operations center which provides publicly supported dial-up travel information (traffic and transit) together with other Internet, wireless and broadcast services to both public and private clients. At the same time, SmartRoute Systems is focused on a range of commercial markets to support continuing operations including cable TV, Internet service providers, cellular telephone companies and in-vehicle navigation. Revenues include advertising and fee for services.

MODE OF OPERATION:

SmartRoute Systems offers fully integrated databases, which are processed using proprietary software architecture, for its clients. A range of public and SmartRoute Systems data sources — such as cameras, loop data and realtime information — feed live traffic conditions to the centers from transit agencies. Owners of data include public agencies, but SmartRoute Systems also deploys its own monitoring systems to supplement public coverage. These monitoring systems include aerial surveillance and public sector communication links as well as "probes," trained commuters and truck drivers who report on incidents and traffic conditions.

INSTITUTIONAL RELATIONSHIPS:

Contractual relationships differ for each city. As a general arrangement, SmartRoute Systems designs, builds and operates the operations center. Transportation agencies provide their traffic and transit data to the center for free, which SmartRoute enhances into a traveler information product that the public agencies can access without charge for their internal use. In exchange for the private investment, SmartRoute receives a fee for center operations and the supply of the free traveler information services. It also maintains certain rights (which vary from project to project) to sell the enhanced product through a variety of media. Overall, this arrangement enables the public sector to avoid the financial burden of constructing and operating the centers and the information system and provides an opportunity for SmartRoute Systems to develop self-sustaining traveler information businesses.

EXAMPLE #10

PURPOSE/SCOPE: Nationwide, Inter-City Traveler Information System
NAME: Trafficmaster
LOCATION: United Kingdom
OWNER/OPERATOR: Trafficmaster

Trafficmaster is a system that provides in-vehicle traffic information, specifically congestion warnings, to British motorists on a nationwide basis. First introduced in 1988, it currently covers all British motorways and trunk roads — some 7,500 miles total.

UNIQUE FEATURES:

Trafficmaster service combines purpose-built, in-vehicle receivers with a proprietary database. The database has been developed with the support of the first license to install privately owned detectors on the U.K. motorway network. Trafficmaster has since developed a range of products that tap its traffic information database, ranging from promotional giveaways to color-screen, after-market dashboard devices.

MODE OF OPERATION:

Trafficmaster 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.

Traffic conditions data are broadcast in encrypted form to Trafficmaster's subscribers and displayed visually on small receivers mounted on a vehicle's dashboard. The vehicle tracking data provides point-to-point journey time estimates and will be commercially available to fleet operators and other markets next year.

Trafficmaster has also targeted its services at cellular telephone users. A special receiver 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 a commercial radio broadcasting chain representing 15 percent of U.K.'s commercial radio market.

The company is working with the European motor vehicle industry on an information system known as "Trafficmaster Oracle." These units will be integrated into car radios, so that driver information bulletins will automatically override other radio signals. Several vehicle manufacturers have indicated an intention to install the unit as an option in upcoming models.

INSTITUTIONAL ARRANGEMENTS:

Unit sales of its after-market and OEM receivers have risen from 182,000 in 1997 to a projected 600,000 in 1998. The devices cost about $250, with a monthly service fee of about $15. In Britain, the company has a potential market of some 25 million vehicles, but in Europe, as a whole, the market for its service approaches 200 million vehicles. Therefore, Trafficmaster is marketing its technology aggressively outside the United Kingdom. In April 1997, the company entered into a licensing agreement with a German firm that has agreed to launch Trafficmaster service throughout the entire 8,000 km German autobahn network by mid-1998. In the next year, agreements are also expected with France and the Netherlands. Ultimately, Trafficmaster's strategy is to establish a traffic information network throughout Europe and to make it possible for motorists traveling across the Continent to receive traffic information in their own languages.

EXAMPLE #11

PURPOSE/SCOPE: In-Vehicle Information System
NAME: Vehicle Information and Communication System
LOCATION: Tokyo, Japan
OWNER/OPERATOR: Private Industry, in association with Tokyo Municipal Government, Japan's Ministry of Post and Telecommunications, and the National Police Agency

Over the past 10 years, a substantial increase in traffic congestion in Tokyo created a strong customer demand for timely traffic information. This demand propelled Japan to a position of world leadership in providing real-time traveler information services. The principal service, VICS (Vehicle Information and Communication System) uses beacons and FM broadcasting to provide current information about congestion, incidents, traffic restrictions and parking — including route guidance — to the large number of Japanese vehicles already equipped with appropriate in-vehicle navigation systems.

UNIQUE FEATURES:

The Japanese systems have been developed in close cooperation between the Japanese vehicle manufacturers and the national public agencies concerned with traffic. Based on a national commitment to in-vehicle route guidance (more than three million units installed), a public-private program was developed to provide real-time data to further improve navigational and related service features for Japanese drivers. The information available covers both expressways and urban arterials on an integrated basis. The traveler information is being made available free of charge, financed by a sales tax on the equipment. A wide range of in-vehicle VICS receiver models are available, with varying features providing information in map, text, and graphic form including real-time traffic-responsive route guidance. More than one million "VICS-capable" units are expected to be sold by the year 2000.

MODE OF OPERATION:

Traffic information is developed from an extensive network of traffic detection, based on ultrasonic and other technologies as well as police reports. Beacons that provide the local information are being installed on arterials in larger cities and on the inter-city expressway network. The information is transmitted to users using a FM multiplex broadcasting system (for wide-range distribution) and roadside microwave and infrared beacons. Processed information is provided to subscribers via a variety of methods, such as personal computers, and in-vehicle devices. In-vehicle VICS units translate the updated traffic information to seek the most efficient route and directs the driver to the destination. Information updates are transmitted to the subscribers every five minutes.

INSTITUTIONAL ARRANGEMENTS:

VICS was established in 1995 as a cooperative public-private venture to integrate traffic information collected by the National Police Agency (in charge of street traffic control) and the Ministry of Construction (in charge of expressway operations), local government and private industry. Since then, the VICS service has been expanded to major metropolitan areas and all expressways in the nation. 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.

EXAMPLE #12

PURPOSE/SCOPE: Transit Passenger Information Systems
NAME/LOCATION: Infobus, France
Project Countdown, London, England

In France, Infobus provides transit customers real-time schedule information for the next five buses, in the designated direction, expected at the customer's chosen bus stop. The system has been tested in the Paris suburb of Neuilly and is currently being tested in Metz. A total of 2000 bus users are taking part in the trials, which involve 12 local bus routes and 130 buses.

The purpose of London's Project Countdown is to provide transit customers waiting at bus stops the estimated arrival time of buses. The provision of transit vehicle arrival time eliminates one of the most common sources of rider dissatisfaction.

UNIQUE FEATURES:

Transit users are provided with schedule and arrival time information that reduces the uncertainty often associated with bus operations.

MODES OF OPERATION:

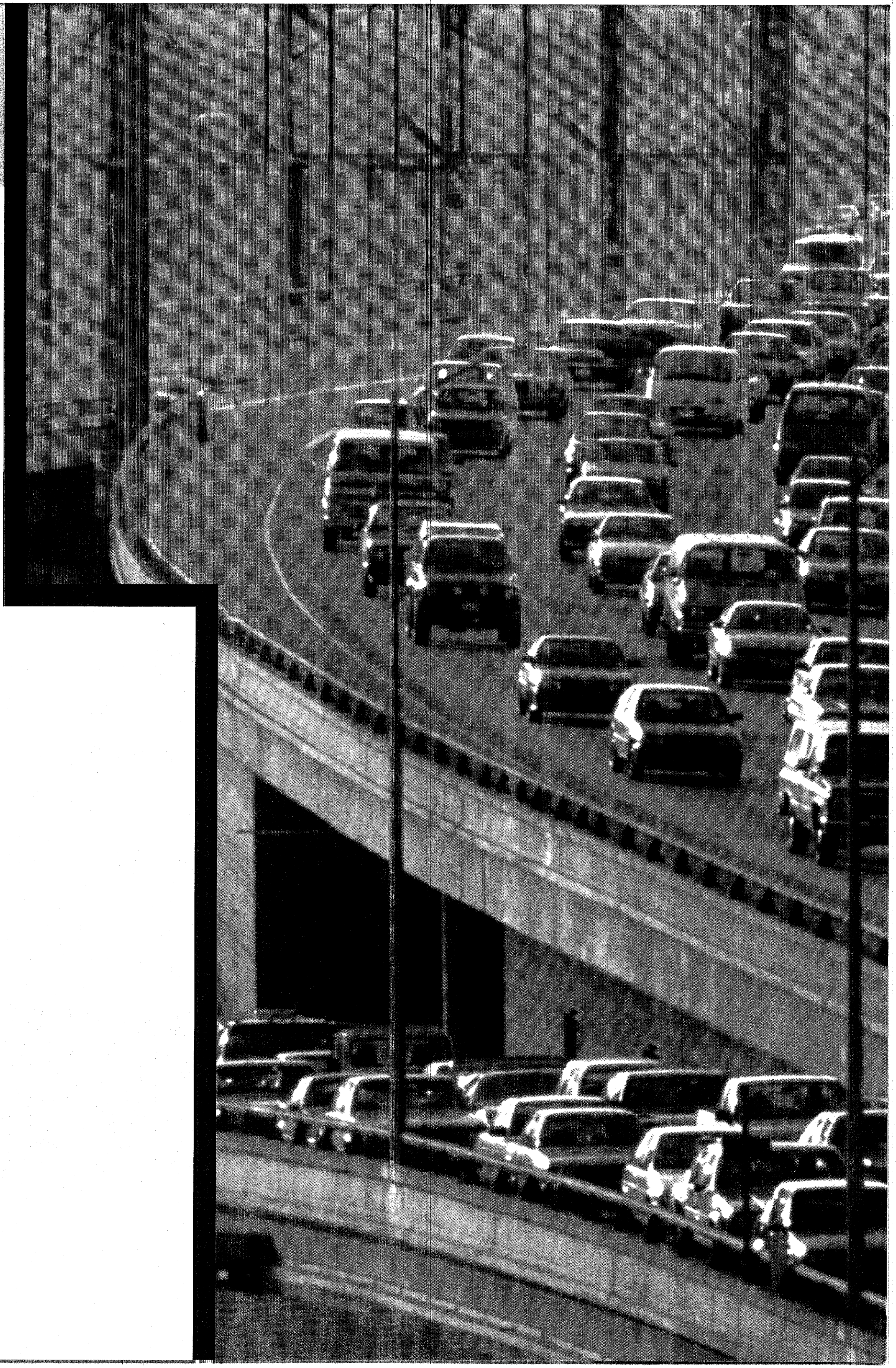
Infobus: Using automatic vehicle location, transit system fleet monitoring centers provide data to Infobus. Infobus packages this data and transmits it by pager to subscribers. The pagers contain a memory that is four times greater than the memory of conventional pagers, enabling the unit to calculate the waiting time for buses by comparing timetable data (updated hourly) with the exact position of the buses, transmitted every 30 seconds. By performing the comparisons every 30 seconds, the Infobus pager can determine each vehicle's speed and calculate its likely arrival time. In addition to giving bus information, the Infobus pager can also receive personal messages.

Project Countdown: This system uses automatic vehicle location (AVL) technology to provide estimated arrival times of its buses at stops. Microwave beacons that "talk" to onboard transponders have been installed on signposts along a 10-mile bus route. The position of each bus as it passes a beacon is transmitted to a main control center for processing.

The central computer constructs a real-time "path" along the route using the known current location and registered destination of the bus. Forecasts of arrival times are computed according to current travel conditions, as reported by the actual passage of the three previous buses along each section of the route.

After the location data is processed by the main control center, the data is transmitted to electronic visual displays at each bus stop for awaiting passengers. For each of the buses approaching the stop, the route number, destination, and minutes-to-arrival are presented in red LED characters.

London authorities hope to have 4,000 bus stops (a quarter of London's total of 17,000 bus stops) equipped with electronic information displays within five years. So far, more than 350 bus stops have been equipped with electronic signs showing arrival information for 30 routes and benefiting some 70 million passengers a year.



A RESOURCE GUIDE

Operations Core Business Unit (HOP-1)
Federal Highway Administration
U.S. Department of Transportation
www.fhwa.dot.gov/cbuopera.htm
(202)366-6726

Motor Carrier Safety Programs Federal Motor Carrier Safety Administration
U.S. Department of Transportation
http://mchs.fhwa.dot.gov
(202)366-0950

Office of Mobility Innovation
Federal Transit Administration
U.S. Department of Transportation
www.fta.dot.gov
(202)366-4995

The National Associations Working Group for ITS
The National Associations Working Group for ITS is a partnership of the U.S. Department of Transportation and more than thirty State and local government associations. The web site is a shared Internet resource of continuously updated ITS information from these associations and other sources.
www.nawgits.com/icdn

The Intelligent Transportation Peer-to-Peer Program
An ITS technical assistance program sponsored by FHWA and FTA for transportation professionals
www.dotpeer@erols.com
(888) 700-PEER

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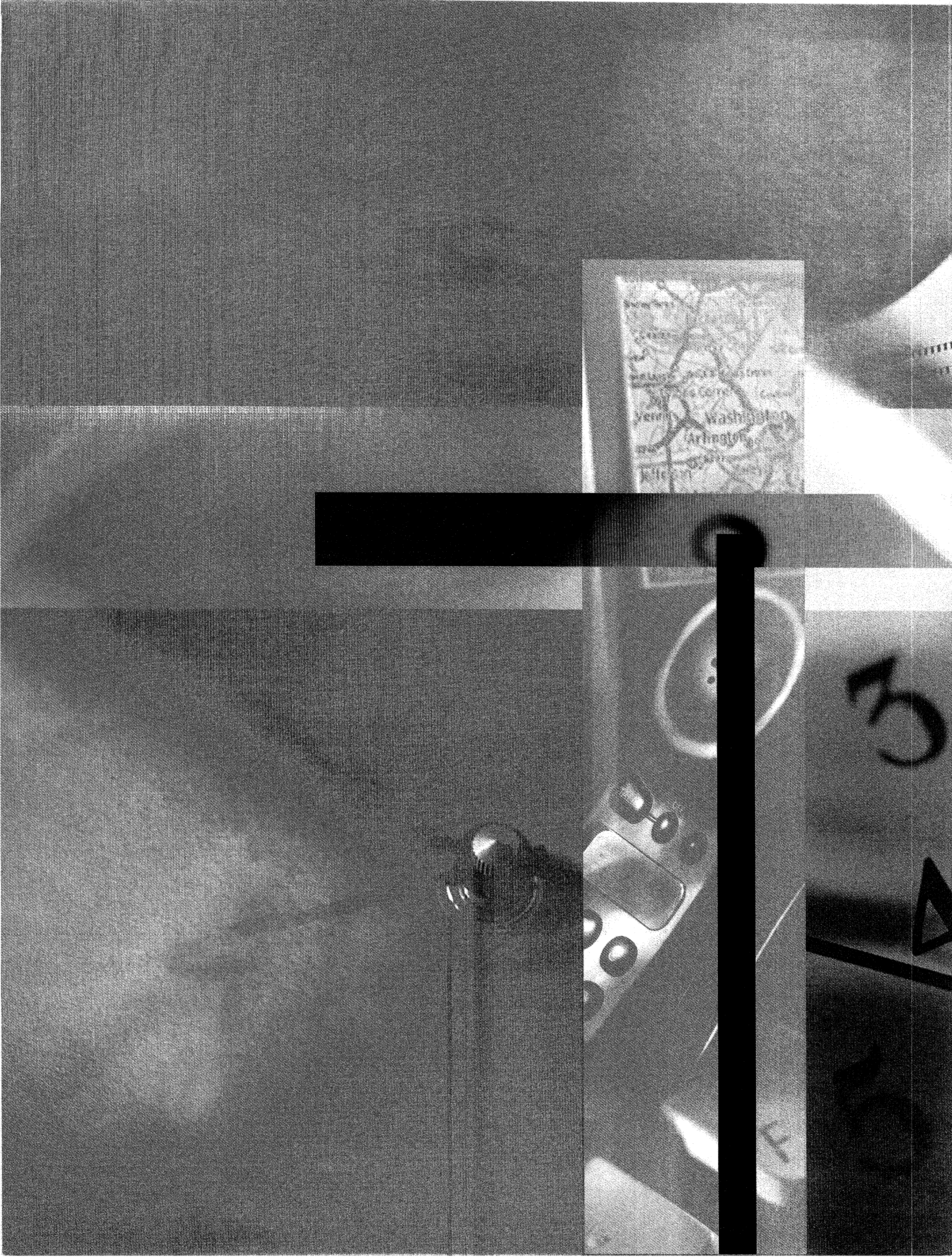
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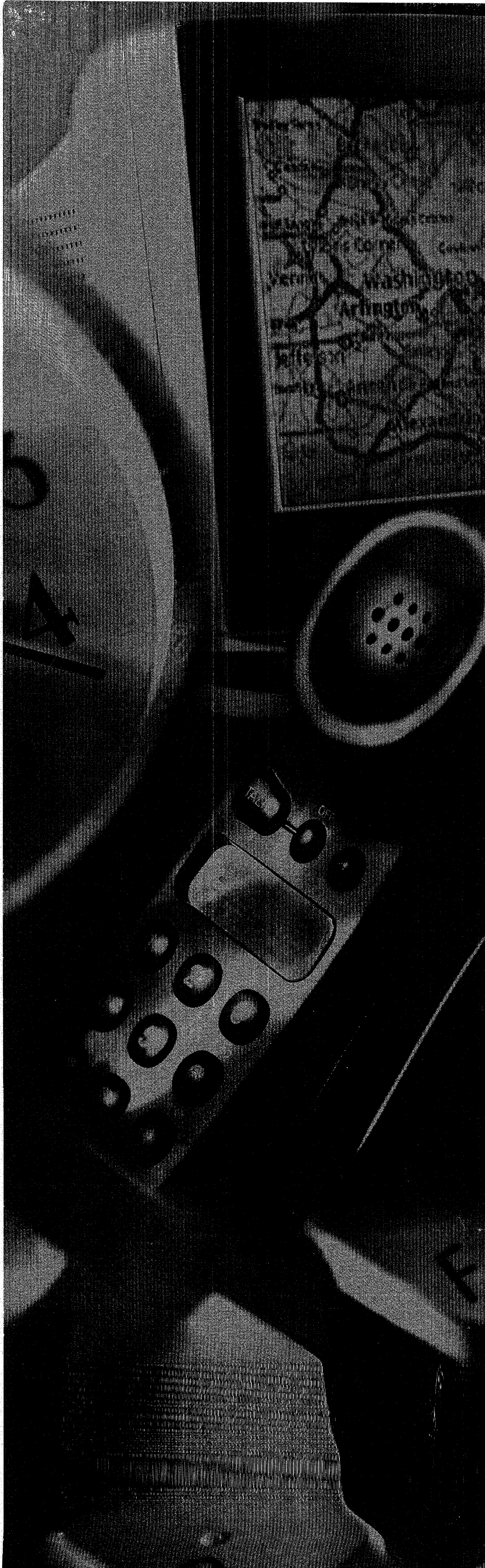

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