ITEM 10 - Information
June 20, 2007

Report on the TPB Work Session on the Metropolitan Area Transportation Operations Coordination (MATOC) Program, and Recommendations on Traffic Management Strategies for the Region

Staff Recommendation: Receive briefings on

- the special MATOC Program Work Session held immediately prior to today's Board meeting, and on the overall status of the program
- recommendations based upon the Traffic Technology International magazine article referred to the MOITS Task Forces by the TPB at its March 21 meeting.

Issues: None

Background: The enclosed article entitled "Most Wanted: Traffic Management's Magnificent 10," summarizes the author s opinion of the ten most successful worldwide uses of technology developments over the last twenty years.

At the March 21, 2007 meeting, the TPB referred the article to the MOITS Policy and Technical Task Forces for a response and recommendations. The MOITS Task Forces reviewed and provided recommendations in the enclosed memorandum.

National Capital Region Transportation Planning Board
777 North Capitol Street, N.E., Suite 300, Washington, D.C. 20002-4290 (202) 962-3310 Fax: (202) 962-3202 TDD: (202) 962-3213

MEMORANDUM

TO: Transportation Planning Board

FROM: Andrew J. Meese, AICP
Principal Transportation Planner

DATE: June 14, 2007

SUBJECT: Metropolitan Washington and *Traffic Technology International* Magazine's "Most Wanted: Traffic Management's Magnificent 10"

Introduction

An article by Philip Tarnoff of the University of Maryland appeared in the February/March 2007 edition of *Traffic Technology International* magazine, entitled "Most Wanted: Traffic Management's Magnificent 10". This article summarizes, in the opinion of Mr. Tarnoff, the ten most successful technology developments over approximately the last twenty years. This list is accompanied by a sidebar list of seven that have unmet potential. The article, which is attached, comments on worldwide use of these technologies, and is not specific to the Washington region.

Former Transportation Planning Board (TPB) member John Mason forwarded the article and recommended its distribution to the TPB. At the March 21, 2007 meeting, the TPB approved a motion by David Snyder referring the article to the MOITS Policy Task Force for a response and recommendations. The MOITS Task Forces reviewed and discussed the article at its April, May, and June meetings.

The Article's Ten Most Successful Technology Developments

The article reviewed a number of major technologies or technology-related strategies used for transportation management. Ten were listed as success stories (nationally/worldwide):

- Adaptive signal control (fully automatic, field detector-based systems)
- Automated enforcement
- Electronic payment systems (both for transit and tolls)
- Freeway ramp metering
- In-vehicle navigation systems
- Probe technology (monitoring traffic conditions through tracking cell phone, global positioning system, or toll tag devices)
- Service patrols
- Transit information systems
- Light-emitting diode (LED) displays for field equipment
- Low visibility warning systems.

Seven technologies or strategies were said to have "unmet potential". These again were from a national and worldwide perspective, not solely from a Washington metropolitan area perspective. These were:

- Actuated traffic signal controllers (issue of balancing heavy mainline traffic volumes with low-volume side street access)
- Advanced traveler information systems (though the Washington region has success stories including 511 Virginia and the WMATA Ride Guide, across the country complex regionwide systems have been difficult to develop and sustain)
- Bus priority systems (results reported as only "modest")
- In-vehicle safety systems (progress has been slow)
- Productivity-enhancing tools (software and procedural enhancements are slow in being adopted)
- Variable message signs (opportunities for more effective use)
- Vehicle Infrastructure Integration (VII) Initiative (federal initiative for the much more automated roadway of the future).

What Is Being Done in the Washington Region

Many of the successful strategies are cornerstones of the robust management activities undertaken by the Washington region's transportation agencies. Of the list of strategies in the magazine article, regional success stories include safety electronic payment systems, service patrols, transit information systems, light-emitting diode (LED) displays for field equipment, and the use of variable message signs. Some deployments or tests have been undertaken on some of the other technologies mentioned, including adaptive signal control, automated enforcement, freeway ramp metering, probe technology, and bus priority systems.

DDOT, MDOT, and VDOT all have established traffic management systems. The three departments all pursue strategies for managing their transportation systems, including operation of 24/7 traffic management centers, roadway surveillance, service patrols, and communications interconnections among personnel and systems. All three focus on getting timely word out to the media and public on incidents. Local-level transportation agencies also play important roles in transportation management, particularly on local roads and traffic signal optimization.

The transit agencies of the region also have a number of success stories for management and operations. The regional use of SmarTrip card for rail fares, bus fares (for WMATA services, deployments on other bus systems are in process), and parking at WMATA facilities is one of the most comprehensive and integrated for any metropolitan area in the country. Traveler information has also been an emphasis area for the region's transit agencies, include the multi-agency Ride Guide system operated by WMATA, rail station information displays, Nextbus™ displays, and other efforts. Notably, Montgomery County is one of the only jurisdictions in the nation with co-located traffic and transit management centers for true intermodal coordination.

Key to the success of deployments is the operations orientation of the region's transportation agencies (versus a traditional construction orientation), and a high level of interagency coordination through MOITS, the fledgling Metropolitan Area Transportation Operations Coordination (MATOC) Program, and other regional and subregional forums.

Recommendations

The MOITS Task Forces identified four recommendations for the TPB based on review of the magazine article. These are to support continued and enhanced resources for:

1. **Operations programs and activities:** Investments in operations-oriented strategies have time and again shown good benefit-cost ratios and best enable transportation agencies (for both highways and transit) to provide effective incident management and good customer service, through operations centers and staffs, motorist/safety service patrols, traffic signal optimization, and supporting technologies.

2. **Regional coordination efforts:** Regional coordination of operations is particularly important in our complex metropolitan area. The new MATOC Program is a centerpiece of this coordination, but will depend upon continued participation by member agencies and a modest but critical level of ongoing funding support. Another critical activity will be transportation's continuing participation as Regional Emergency Support Function #1 in the regional structure of emergency preparedness committees.

3. **Traveler information programs:** There is an important need to provide real-time transportation information to the public, a focus of both the MATOC program and of individual member agency activities. Examples include "511" and other telephone services, Web site information, enhanced variable message signs on roadways, passenger information signs in transit systems, and sharing transportation information with the broadcast media. Some programs may utilize innovative public-private partnerships. Availability of good information helps both customer satisfaction and systems management.

4. **Traffic monitoring and detection equipment:** Both real-time transportation information and transportation systems management are dependent upon sufficient, properly working detection equipment in the field. Detector deployment levels on many roadways historically have not been as robust as are needed for today's demands, plus the field equipment is especially subject to maintenance and reliability issues. Resources for detection are key for supporting regional information and management goals.

Attachment

by Phil Tarnoff

MOST WANTED

TRAFFIC MANAGEMENT'S MAGNIFICENT 10

The roads become wild when congestion rides into town. Luckily, cowboys in the field of ATMS are few and far between

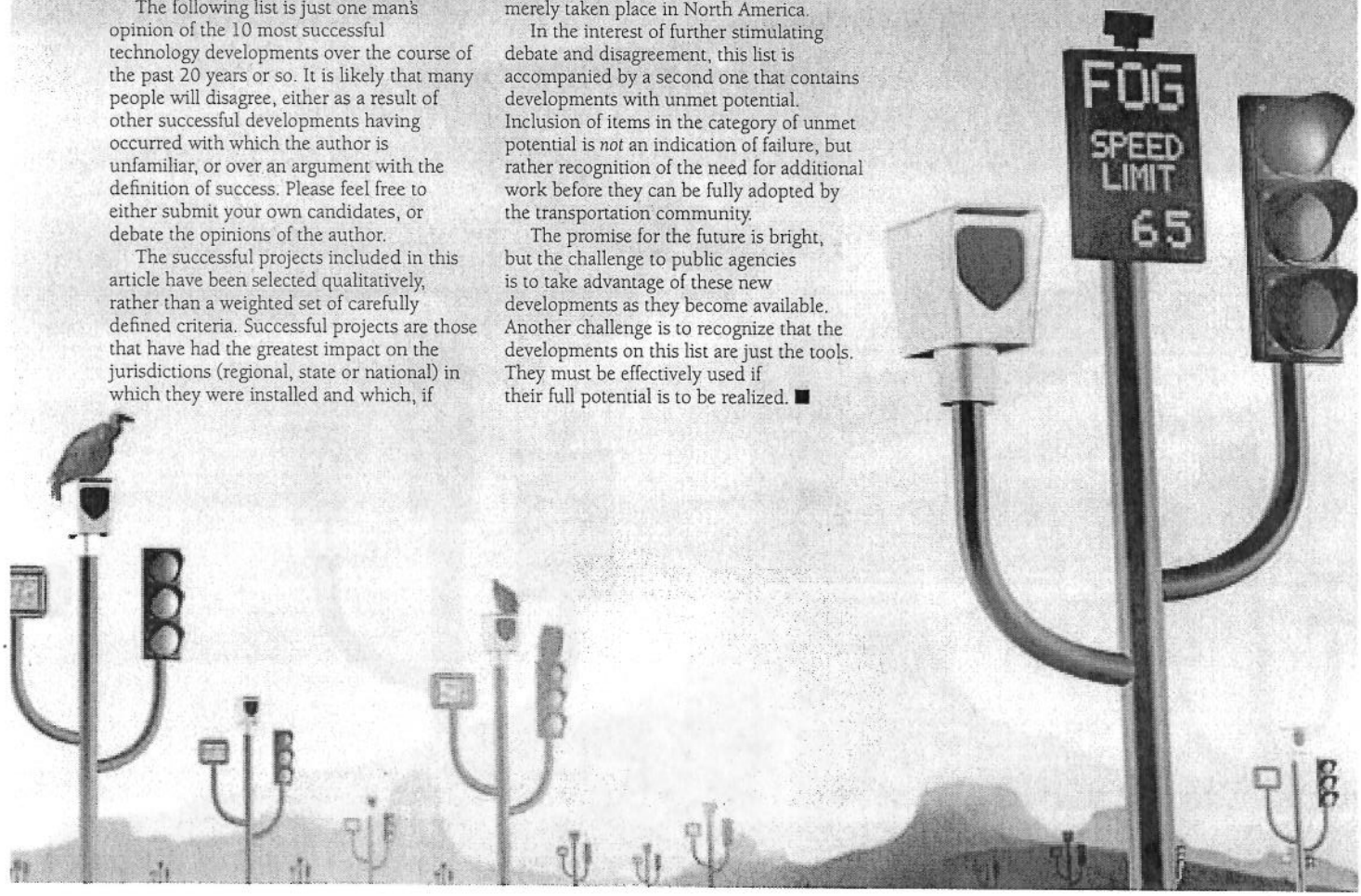
When focused on the preparation of articles discussing the unmet potential of ITS, it is easy to lose sight of the fact that there have also been many significant successes. This feature is intended as a counterpoint to my previous articles, in that it is a positive commentary on the hard work and creativity that has occurred since the dawn of ITS and earlier.

The following list is just one man's opinion of the 10 most successful technology developments over the course of the past 20 years or so. It is likely that many people will disagree, either as a result of other successful developments having occurred with which the author is unfamiliar, or over an argument with the definition of success. Please feel free to either submit your own candidates, or debate the opinions of the author.

The successful projects included in this article have been selected qualitatively, rather than a weighted set of carefully defined criteria. Successful projects are those that have had the greatest impact on the jurisdictions (regional, state or national) in which they were installed and which, if copied by other jurisdictions, offer the prospect for repetition of this success. The following list of successful developments is not presented in any particular order, to eliminate the need for further judgment regarding the relative impacts of the items on the list. It attempts to recognize successes that have occurred throughout the world, rather than focusing on those that have merely taken place in North America.

In the interest of further stimulating debate and disagreement, this list is accompanied by a second one that contains developments with unmet potential. Inclusion of items in the category of unmet potential is *not* an indication of failure, but rather recognition of the need for additional work before they can be fully adopted by the transportation community.

The promise for the future is bright, but the challenge to public agencies is to take advantage of these new developments as they become available. Another challenge is to recognize that the developments on this list are just the tools. They must be effectively used if their full potential is to be realized. ■

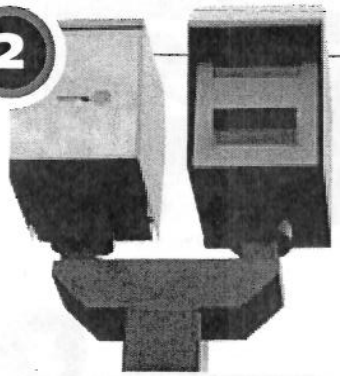


1 ADAPTIVE SIGNAL CONTROL

"The great majority of signal system installations throughout the world are adaptive control systems"

Open-loop traffic signal control – in which signal timing is displayed repetitively without regard for existing traffic demand – was first introduced in the 1950s. As any controls engineer knows, closed-loop control, where the system responds directly to changes in traffic demand, is likely to provide significantly improved performance. In recognition of this, the British and Americans began initial developments of closed-loop traffic signal control (currently known as adaptive control) during the 1970s. A British public-private consortium introduced the first successful adaptive signal control system, known as SCOOT, in the 1980s. This was followed by the announcement of the SCATS system developed in Australia, and subsequently by a number of other European and US systems. Today, the majority of signal system installations worldwide are adaptive control systems, a testimony to its success. Although acceptance has lagged in the USA, the number of installations is increasing.

2 AUTOMATED ENFORCEMENT

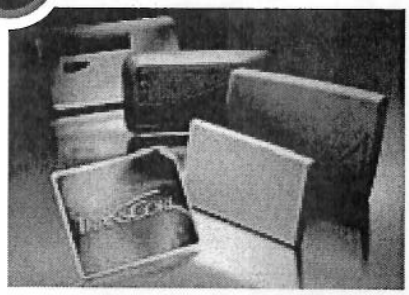


Watch your speed – or we'll watch it for you

No list of significant developments would be complete without considering safety initiatives. Red light-running cameras and speed cameras have been responsible for significant reductions in crashes at locations where they have been installed. One particularly impressive initiative is the speed management initiative implemented in Victoria, Australia, in 2002, where a combination of measures – including extensive use of speed enforcement cameras – has resulted in a 32 percent reduction in fatalities. Can you actually imagine the impact of this enforcement if it were to be adopted nationally for both high- and low-speed roadways?

"Red light running cameras have been responsible for significant reductions in crashes at locations where they have been installed"

3 ELECTRONIC PAYMENT SYSTEMS



Sticker tags for electronic tolling – take-up is expected to go through the roof in the future

When members of the transportation community are asked to identify significant technological advances in ITS, they invariably list the electronic toll collection systems that are a subset of this category. ETC has advanced from islands of technology to regional standards, such as E-ZPass, that provide seamless service to long-distance travelers.

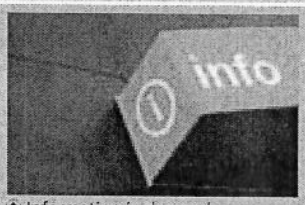
Electronic payment systems are a win-win technology, in that they provide improved services to motorists, while reducing toll authorities' operating costs. ETC has also been used successfully for both transit and parking operations. Expect continuing advances in this technology to include additional standardization across transportation modes, as well as increased use of variable pricing.

"Electronic toll collection is a win-win technology, in that it provides improved service to motorists, while reducing operating costs"

UNMET POTENTIAL?

Actuated Traffic Signal Controllers

Traffic engineers might be surprised to see the humble actuated traffic signal controller appearing here, as these devices are installed at approximately half of the 270,000 intersections in the USA. However, they suffer from a number of serious deficiencies, including an operation that allocates green time to competing approaches based on vehicle presence and waiting times, rather than demand. Their shortcomings are even more apparent when semi-actuated control is implemented, under which the main street demand – presumably the most important intersection approach(es) – is ignored and signal timing is controlled entirely by minor approaches, including left-turn movements and side-streets. The effectiveness of semi-actuated control is further degraded by the fact that unused demand on the minor approaches causes the early start of green on the main street, which in many cases disrupts main street progression. Clearly an improved form of actuated control is required, which may become possible with the implementation of comprehensive traffic monitoring through VII-like systems.



Information in demand...

Advanced Traveler Information Systems (ATIS)

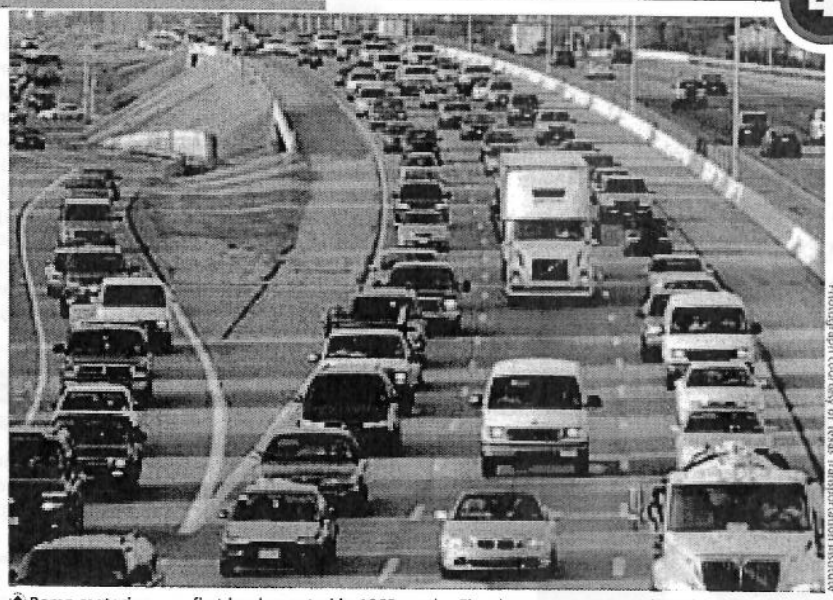
The ITS strategic plan anticipated the development of a robust ATIS industry, with the private sector disseminating information to travelers regarding alternate routes, modes and travel times. This has failed to materialize for a number of reasons, including weak demand, public sector competition, and inadequate information. As congestion increases and information availability improves (through initiatives such as VII), ATIS could re-emerge as a viable commercial enterprise.

FREEWAY RAMP METERING

4

The effectiveness of freeway ramp metering has been demonstrated through numerous evaluations, including most notably the recently concluded Minnesota DOT's evaluation during a brief period when the ramp metering system was shut down by Jesse Ventura, the state's governor. This study concluded that without ramp metering, travel times increased 22 percent and crashes increased 25 percent. These are truly statistics that cannot be ignored.

"Without ramp metering, travel times increased by 22 percent"



Photograph courtesy of Texas Transportation Institute

Ramp metering was first implemented in 1963 on the Eisenhower Expressway (I-290) in Chicago

IN-VEHICLE NAVIGATION SYSTEMS

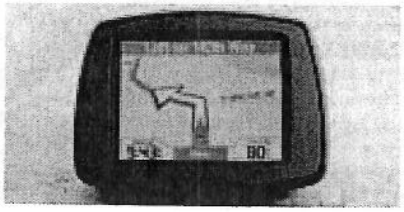
5

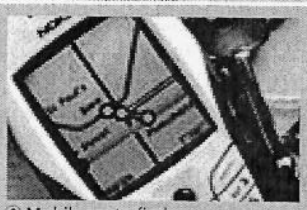
In-vehicle navigation systems have gone from a novelty to a popular vehicle accessory within a very short period. JD Power and Associates estimated that in 2006, 20 percent of new vehicle purchases will include these systems. The popularity and utility of these devices will continue to increase as they become interfaced with the internet and cell phone systems, and provide enhanced information such as real-time travel time and routing information. As their price decreases and features multiply, navigation systems are likely to follow the path of cruise control, in that they will make the transition from an accessory to a standard feature in many vehicles.

"They will make the transition from an accessory to a standard feature in many vehicles"

Galileo will provide enhanced accuracy

Sat-nav systems will undergo a huge change over the next 15 years





Mobile route finders

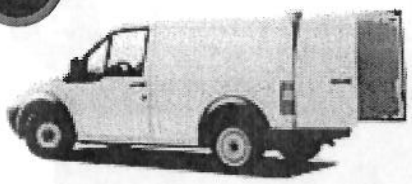
Bus Priority Systems
Experiments and demonstrations of bus priority systems – in which extra green time is provided to reduce signal delays – have been in existence since the 1970s. Invariably, these systems have produced only modest transit-delay reductions, with some improved schedule adherence benefits. In spite of these modest results, transit properties and signal system operators continue to pursue this technology with the hope that newer strategies can provide improved performance.

In-Vehicle Safety Systems
The US DOT and its counterparts throughout the world have invested in numerous programs with the objective of reducing vehicle crashes. As a result of these programs and research conducted by the automobile manufacturers, autonomous safety systems are beginning to find their way into commercial production. Although the effectiveness and reliability of these devices are yet to be proven, the promise of these first-generation systems and their successors is significant.

In-vehicle safety is significant

Productivity-Enhancing Tools
Limitations placed on the size of public agency operations staffs suggest the need for productivity-enhancing software tools that will permit traffic management center management to 'do more with fewer people'. Decision-support systems, visualization, simulation, >

6 PROBE TECHNOLOGY



Commercial vehicles equipped with GPS are providing probe data for traffic analysis
Mobile phone data can also be used for traffic and analysis and even traffic prediction

"Traffic probe technology can be implemented using a variety of techniques"

Conventional traffic detectors (loops, radar, sonic, etc) and traffic-probe technology are quite different. Conventional detectors provide information regarding traffic flow at a particular point (or very limited section) of the roadway. Traffic-probe technology provides more continuous information regarding traffic flow over a longer length of roadway.

Traffic-probe technology can be implemented using a variety of techniques, including tracking GPS-equipped vehicles, tracking cell-phones in use, and measuring travel times of vehicles equipped with toll tags between successive readers. Several successful probe-based projects have been installed, which have demonstrated the value of this technology as a source of traffic flow data for traveler information and traffic management applications. An example of a toll tag-based probe implementation is the TRANSMIT system installed in the Greater New York City area. This system has been so successful that the initial 15-mile installation is planned for expansion to include more than 1,000 miles of coverage.

7 SERVICE PATROLS

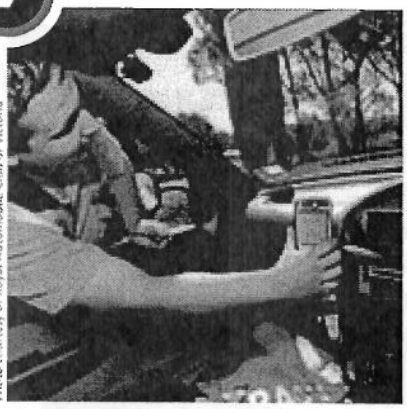


Photo courtesy of Royal Automobile Club of Victoria

Service patrols, while not especially high-tech, do utilize ITS strategies to aid their operation

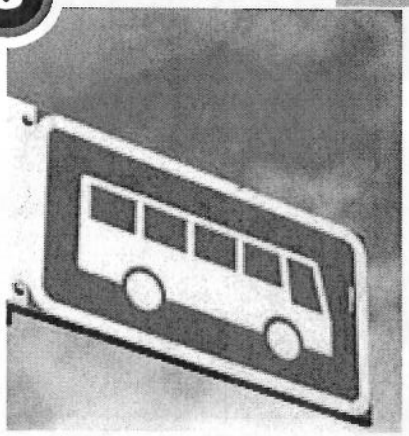
Strictly speaking, service patrols should not be considered an ITS technology since they do not represent a specific high-technology development. Service patrols represent a combination of procedures, trained manpower and equipment intended for response to minor incidents and to provide support in the form of traffic management to major incidents.

However, service patrols epitomize the application of ITS in that they take advantage of its tools (VMS, highway advisory radio, CCTV, and traffic detection) to support their operation. More important, service patrols rely on multi-jurisdictional and multi-functional cooperation and coordination for their success.

Most transportation agencies have implemented some form of service patrol operation. Their significance is demonstrated by the fact that, in the USA alone, service patrols provide an average of 53,000 assists each year.

"Service patrols epitomize the application of ITS in that they take advantage of its tools"

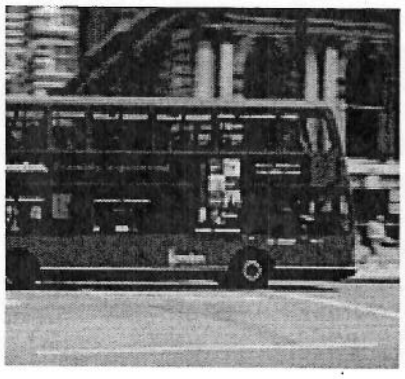
8 TRANSIT INFORMATION SYSTEMS



Transit information systems help travelers make decisions about the choice of transport
Mode, route and departure can be checked

The widespread installation of GPS units in transit vehicles (both bus and rail) has permitted transit operators to expand the range of information services provided to their customers. The availability of wayside displays that provide time-to-next-arrival information has received universal acclaim from transit passengers. When combined with other advances in transit service, such as other sources of real-time transit information, on-line trip planning, electronic payment systems and improved operations are increasing the public's view of transit as a viable transportation alternative.

"Wayside displays providing time-to-next-arrival information are universally acclaimed"



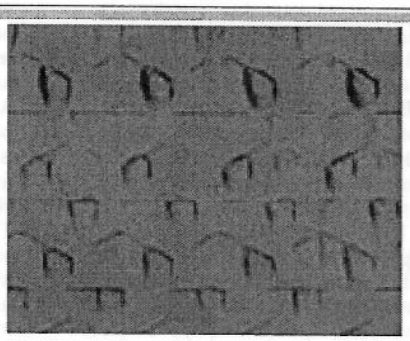
LIGHT-EMITTING DIODE DISPLAYS FOR FIELD EQUIPMENT

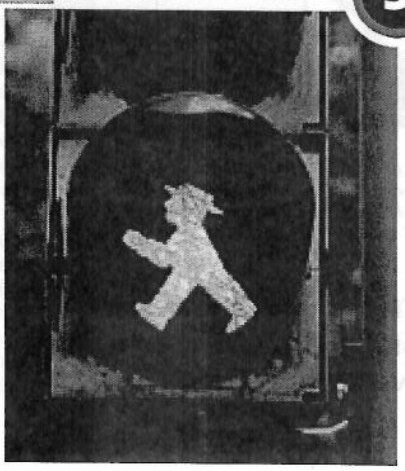
9

Although ITS tends to be synonymous with the use of computers and communications, other aspects of these systems, such as the lowly LED, should also be included on the list of significant developments.

The LED received widespread acceptance as the display of choice for traffic signal heads, pedestrian indications, lane control signs, and variable message signs, once the transportation community recognized its benefits of visibility (safety), reliability and lower life-cycle costs.

"The lowly LED should be included on the list of significant developments"





↑ LEDs have an extremely long life span, when operated conservatively
→ Advantages over incandescent lamps include much greater energy efficiency, longer lifetime between replacement, and brighter illumination with better contrast, even in direct sunlight

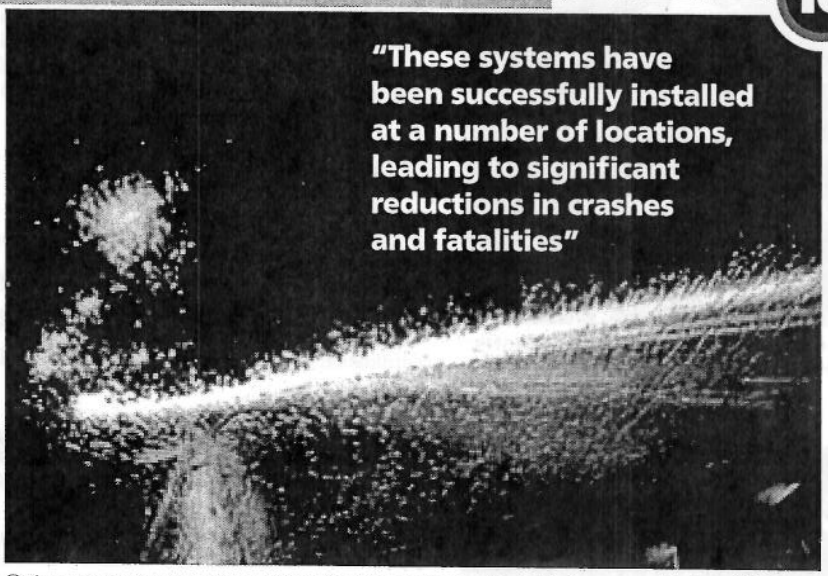
LOW-VISIBILITY WARNING SYSTEMS

10

Low-visibility warning systems are a category of ITS projects that alert drivers to the presence of fog, blowing sand, snow or other effects that lead to significant reductions in sight distance.

These systems have been successfully installed at a number of locations, leading to significant reductions in crashes and fatalities. One particularly successful system was installed on I-75 between Knoxville and Chattanooga, Tennessee, at a location (Calhoun to be exact) that experiences frequent fog events, as a result of a spectacular crash involving more than 100 vehicles, 50 injuries and 11 fatalities.

With its capability for sensing reduced visibility, warning drivers and lowering the speed limit, as well as closing the freeway under extreme conditions, not a single fog-related crash has occurred since the fog-warning system was installed.



↑ The motorist-warning system reduces the frequency of accidents that are caused by low visibility

↑ The tools to achieve more...

< congestion and incident forecasting, etc, offer the possibility of enhancing staff productivity. Yet there are few locations where these tools are routinely employed for this purpose. Research is underway that offers the promise of productivity-enhancing software that will aid traffic management center staff.

Variable Message Signs

Strictly speaking, VMS is a form of traveler information and offers the promise of communicating with motorists at the location and time when information is needed. Effectiveness has been reduced by inadequate flow of information and the failure of operators to consistently post timely and accurate information. VMS is likely to improve in the future as automated traffic monitoring becomes more ubiquitous and decision-support tools become available.

↑ Did you get the message?

VII initiative

This system, with its ability to provide extensive information for transportation system management, could lead to a paradigm shift, in which high-quality traveler information is disseminated and traffic loads are balanced among parallel routes (and modes) in the event of incidents. Obstacles exist to the effective implementation of VII, including funding, institutional and privacy issues. However, it is likely that the VII system or a facsimile of this system will be implemented within the next five to 10 years.