

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.

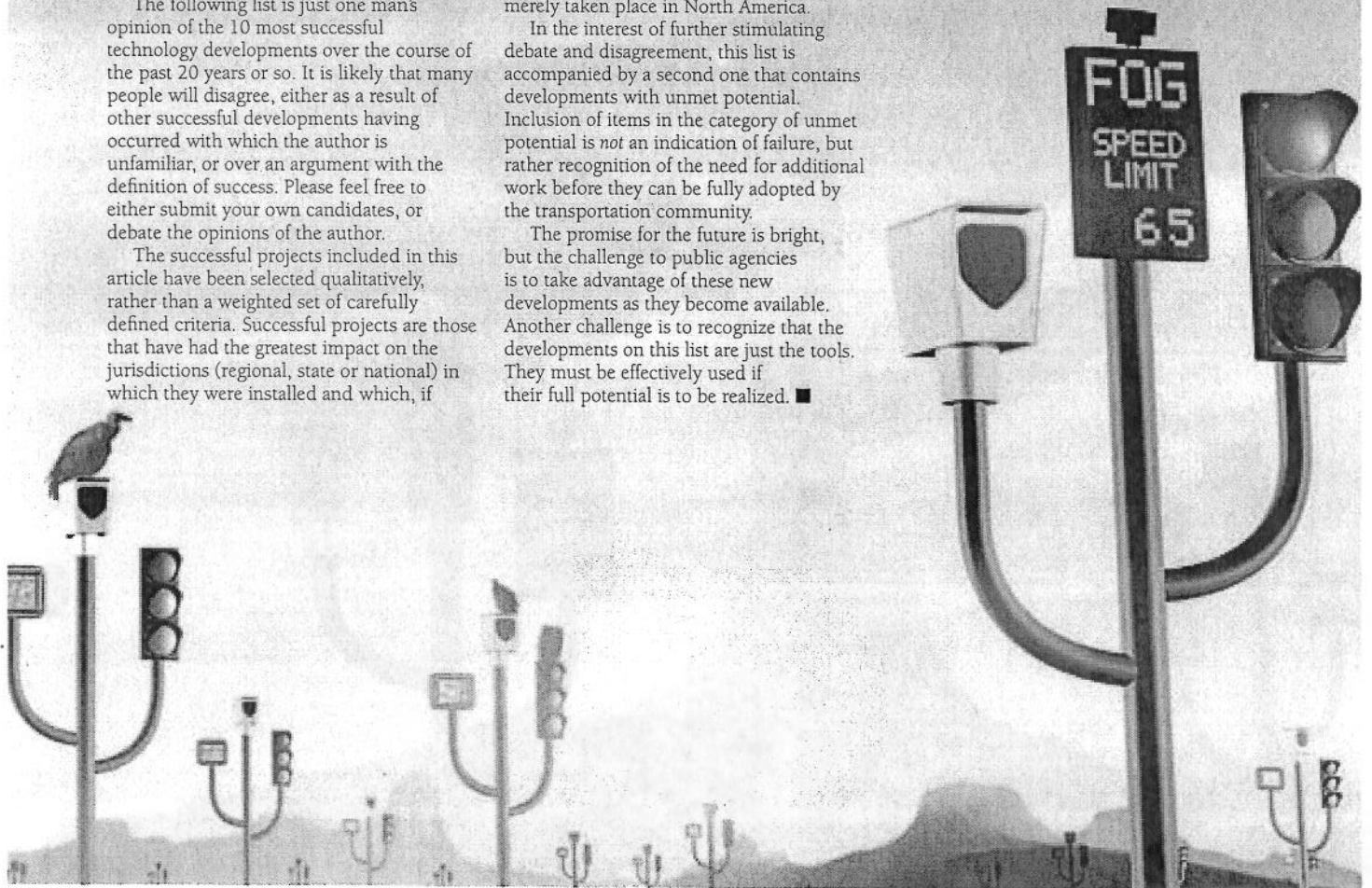
The following list is just one man's opinion of the 10 most successful technology developments over the course of the past 20 years or so. It is likely that many people will disagree, either as a result of other successful developments having occurred with which the author is unfamiliar, or over an argument 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

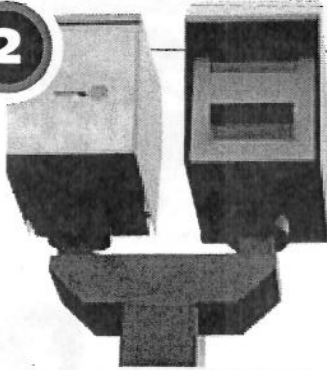
"The great majority of signal system installations throughout the world are adaptive control systems"

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



⤴ Information in demand...

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.

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.

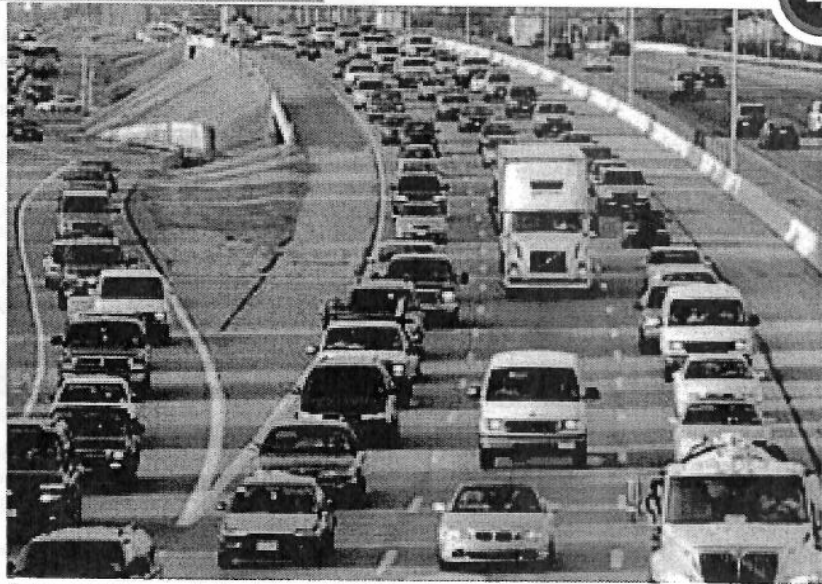
FREEWAY RAMP METERING

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”



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

Photograph courtesy of Texas Transportation Institute

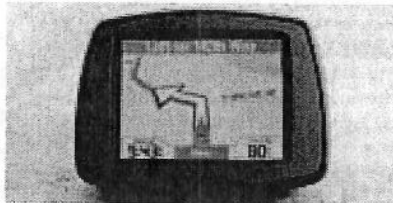
IN-VEHICLE NAVIGATION SYSTEMS

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



↑ In-vehicle safety is significant

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.

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



- ✦ 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

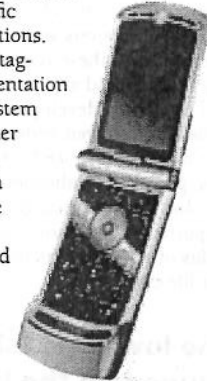
"Traffic probe technology can be implemented using a variety of techniques"

PROBE TECHNOLOGY

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

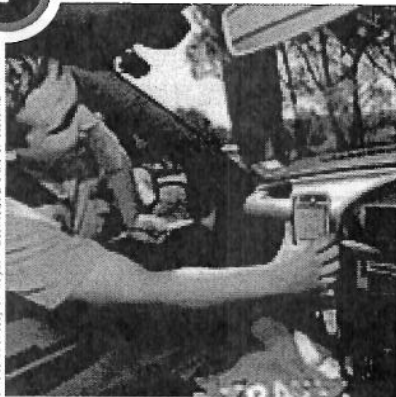


Photo courtesy of Royal Automobile Club of Victoria

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

SERVICE PATROLS

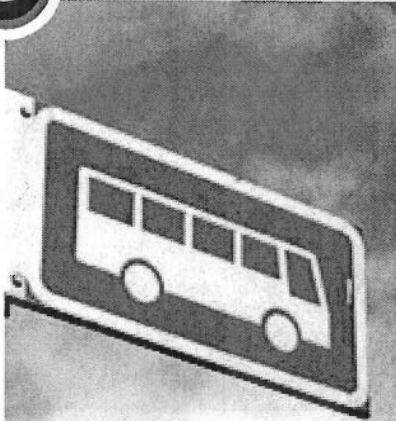
Strictly speaking, service patrols should not be considered an ITS technology since they do not represent a specific high-technology development. Service patrols represent a combination of procedures, trained manpower and equipment intended for response to minor incidents and to provide support in the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



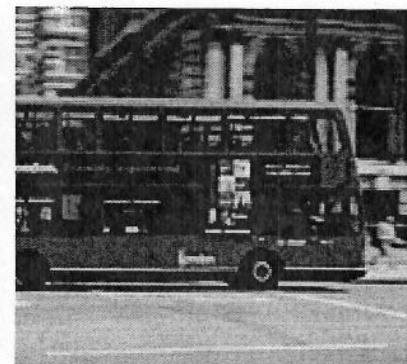
- ✦ Transit information systems help travelers make decisions about the choice of transport
- ➔ Mode, route and departure can be checked

TRANSIT INFORMATION SYSTEMS

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"



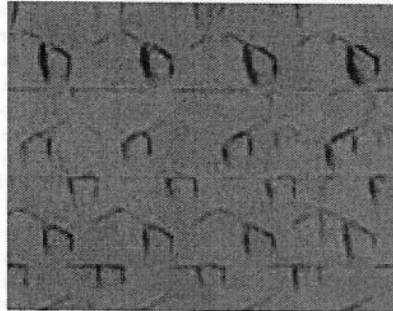
LIGHT-EMITTING DIODE DISPLAYS FOR FIELD EQUIPMENT

9

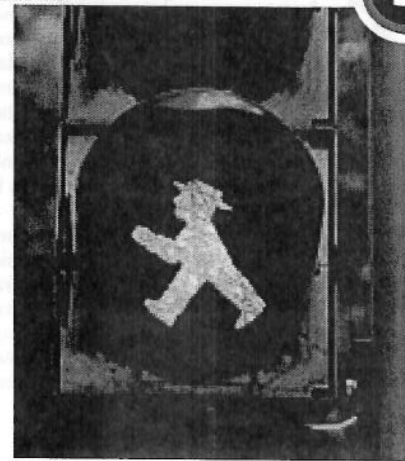
Although ITS tends to be synonymous with the use of computers and communications, other aspects of these systems, such as the lowly LED, should also be included on the list of significant developments.

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



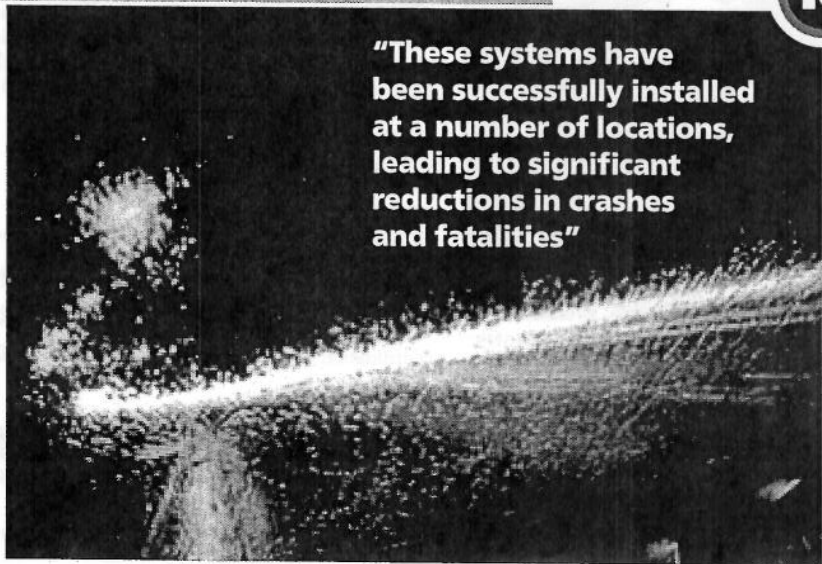
LOW-VISIBILITY WARNING SYSTEMS

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.



"These systems have been successfully installed at a number of locations, leading to significant reductions in crashes and fatalities"

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



↑ The tools to achieve more...

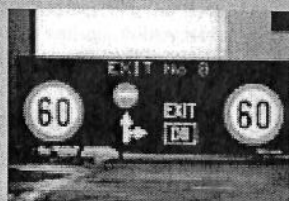
- < congestion and incident forecasting, etc, offer the possibility of enhancing staff productivity. Yet there are few locations where these tools are routinely employed for this purpose.

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.