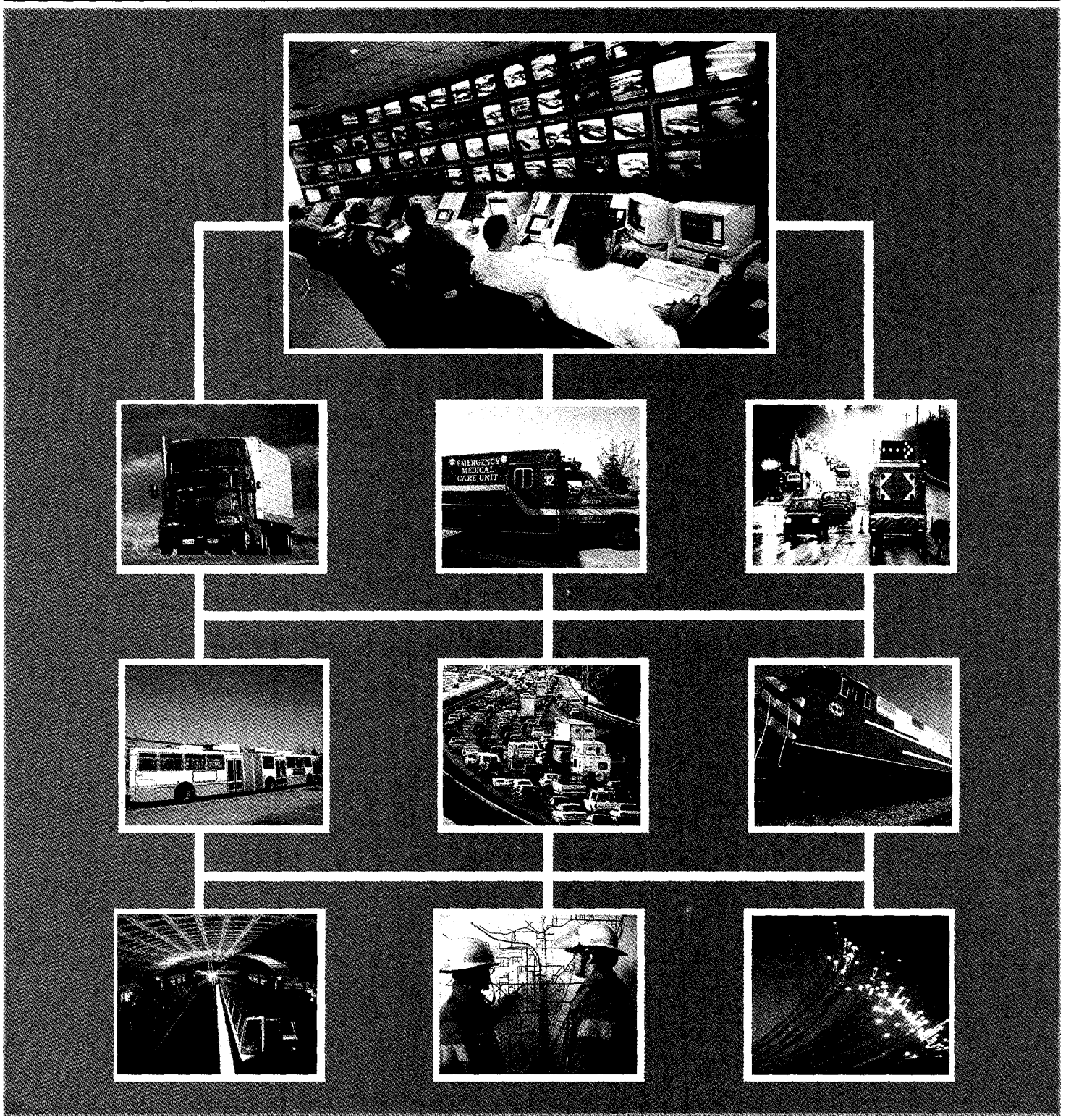
Operations and Management: What Does it Mean for Local Agencies?



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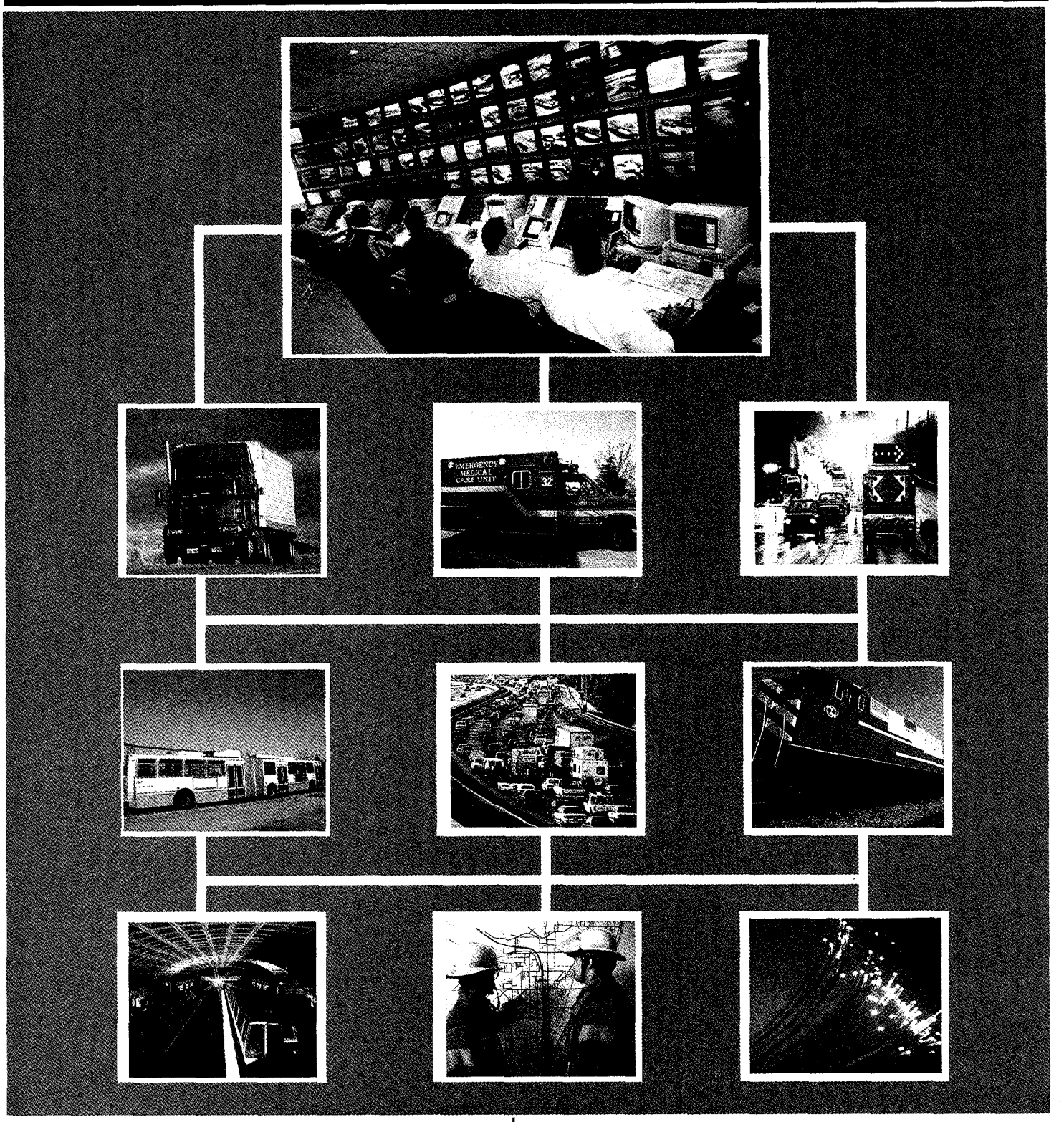

by
Peter B. Fleischer
and Robert Hicks

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About Public Technology, Inc.

PTI is the non-profit technology R&D organization of the National League of Cities, the National Association of Counties, and the International City/County Management Association. Since 1971, PTI has tapped collective research through its member jurisdictions and partnerships with private industry to create and advance technology-based products, services, and enterprises in cities and counties nationwide.

PTI's membership includes the Urban Consortium (UC), a special network of the nation's largest cities and counties. Working in five task forces (transportation, environmental, energy, telecommunications/information, and public safety), UC jurisdictions identify and test new solutions for common concerns and share their findings with a wide audience of local governments, large and small.

A preliminary draft of this paper was presented at the Institute of Traffic Engineers' 2000 International Conference: "Transportation Operations: Moving Into the 21st Century." The paper, "Are Transportation Systems Operations & Management Relevant to High-Level Decision Makers?" was distributed on a CD-ROM along with other presentations to all conference attendees.

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Introduction

In the world of transportation infrastructure, local governments will spend billions on additions to the current transportation system and millions on system maintenance. Oddly enough, these same jurisdictions neglect to allocate adequate funds for even the most basic requirements to operate and manage the current system. Let's take a look at some of the reasons.

Dollars & Cents: Everyone Loves a New Project

The public appreciates the direct benefits of new road, rail, or bridge capacity, such as ease of movement, wider capacity, and faster, safer travel. Elected officials enjoy participating in public ceremonies such as like ribbon cuttings as these commemorate the tangible application of constituents' tax dollars. Engineers, unions, and construction companies value the ability to capitalize on growing demand for new projects, which enable additional revenue streams. Even governmental employees like system additions for the potential to advance within an organization and gain added responsibility.

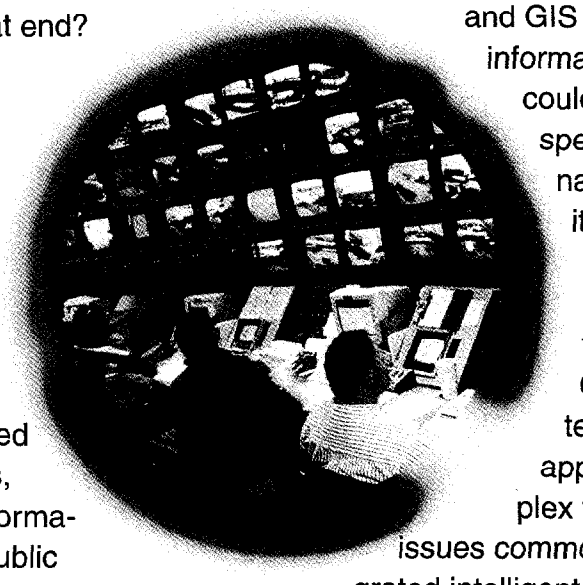
Likewise, maintenance offers numerous benefits to both its providers and recipients. Labor intensive, maintenance provides ongoing employment for public sector and contract workers.

Furthermore, both elected officials and the public appreciate well maintained transportation venues for continued safety and ease of use. With badly maintained roads and routes, elected officials can become vulnerable to the public's repeated complaints.

Today, after a decade of increased federal spending (e.g. ISTEA and TEA-21) transportation systems nationwide are poised to be in their best shape ever. With billions already invested into new projects, maintenance, and safety, jurisdictions all over the United States continue to spend more for the ability to straighten curves on dangerous highways, replace battered guardrails, improve transit systems, and regularly smooth bumps in the road. From a straight and level view, the access and congestion of a transportation system have become bête noire of decisionmakers.

Enter O & M

Into this challenge steps operations and management (O&M). The federal government paid for some of the system; cities, counties and states built it; and the public derives its benefits. But who's in charge? Who runs the system? Who ensures the system's efficient and effective use? And to what end? At its fundamental core, O&M is fundamentally about making the best possible use of a region's current transportation system.



To achieve this goal, proponents of O&M employ creative and enhanced technological applications, improved use of traffic information, prescriptive use of public policy, improved connections between transportation modes, benchmarking, interjurisdictional coordination and staff training. Cities and counties across the United States now use these O&M techniques to ameliorate problems that have accompanied the growth and/or success of the nation's transportation system.

In many jurisdictions, O&M is synonymous with maintenance. In these locales, the repair or replacement of a corroded light pole or a downed street sign is a critical operations function that would be well served by a modern and enlightened management system. In general, these operational activities are low-tech functions guided through low-tech means. However, proper deployment of fixed asset databases, routing programs, and GIS (geographic information systems) could improve the speed of maintenance and reduce its cost.

Other jurisdictions that view O&M as a high-technology approach to complex transportation issues commonly use integrated intelligent transportation systems, incorporating hardware, software, data, and brainware (which these jurisdictions will avow as the most important of variables).

Whether a jurisdiction approaches a maintenance problem or designs a sophisticated traffic information system, intelligence counts. Each locale must specify the required data and the methods to gather, analyze, use, and disseminate it.

O & M: The Small Picture

On Wednesday at noon, an accident occurs at an intersection in Montgomery County, Maryland. It happens that this intersection provides a camera location for the county's advanced transportation management system (ATMS). In the transportation management center (TMC), a technician viewing a small console becomes aware of the incident. An emergency protocol ensues and the TMC establishes contact with emergency personnel. Soon, technicians monitor what has become a major backup on a vital arterial route. The cross street — a local road — becomes congested as well.

Montgomery County's TMC places transportation and transit technicians in close proximity. While monitoring the incident, a transportation technician maintains voice contact with transit technicians and the TMC can concurrently implement decisions about buses, their schedules, detours, passenger delay and notification of road and lane closures.

The technician observes the scene until local police reopen a lane for traffic. The technician instantly resets the intersection's signal timing to enable the flow of travelers, opting for a previously defined signal scenario that heavily favors arterial flow. As the police open a second lane, the technician once again adjusts the signal timing. By electronically manipulating multiple cameras, the technician can assess the length and severity of the backup.

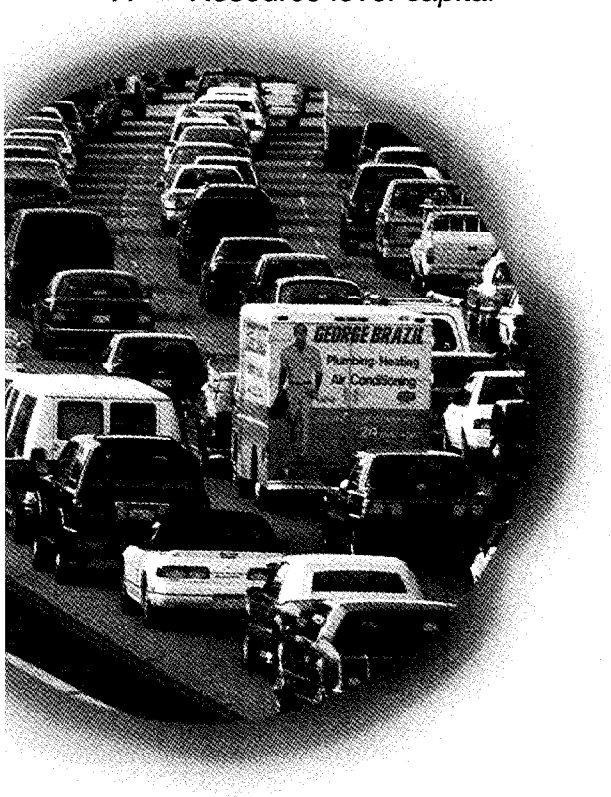
Loop detectors feed additional data to the technician alongside the video. This additional information enables the technician to augment previous, strategic plans for balanced safety, arterial flow, and local street conditions. Within a short period, the backup clears, the damaged vehicles are removed, and conditions return to normal. All the while, the transit operator continues communications with bus drivers and ultimately with bus passengers awaiting delayed buses.

That day, in that spot, technicians applied several technologies, performance measurement, feedback data, a county operational plan, and their best judgment to manage the day's operations. Action was coordinated with the incident management team. In a microcosm, this scene serves as a model for efforts on a larger scale from corridors to counties to regions. Intelligence, information, coordination and implementation form an operational management loop that can effectively guide traffic management at all levels.

O & M: The Big Picture

Doug Wiersig, Deputy Director, Department of Public Works and Engineering for the city of Houston and Chair of PTI's Transportation Task Force, is a veteran of traffic wars in Texas' largest city. He is also well versed in O & M issues in cities and counties across the United States. Wiersig named seven factors that create heavy impact on a jurisdiction's O&M challenge:

1. *Technology deployments*
2. *Staffing (level, quality, training)*
3. *Physical system performance*
4. *Mobility/congestion system performance*
5. *Incident performance*
6. *Resource level-operating (staff, maintenance)*
7. *Resource level-capital*



Wiersig's list highlights three distinct facets of an O&M culture: resources, technology and performance measurement. Giving particular emphasis to performance measures, Wiersig said, "Police and fire departments live and die over such measures."

In noting the interrelationship among resources, technology, and performance management, Wiersig stressed that local transportation officials must monitor each area to maintain a critical balance for ensuring effectiveness. "Elected officials," he said, "will tend to steer funds toward activities that can be physically seen and touched." This generally puts operations at a disadvantage. He added, "Maintenance needs a crisis to get funds."

O & M: Reports from the Field

In this paper, seven cities and counties have contributed the strategies they have adopted to to meet the challenges posed by operations and management. Each jurisdiction defines O&M in its own terms, adapting different approaches. Commonly, they seek greater transportation system effectiveness in terms of mobility, public safety, and economic development.

Monroe County, New York

In upstate New York's Monroe County, Frank Dolan, director of transportation, emphasized the importance of a trained, knowledgeable staff, stressing that improvement in operations stems from the actions of those familiar with a region's geography, assets, technology, problems, and needs. In recognizing that operational change builds upon practical gradualism and considers unique resource limitations, Monroe County has implemented its Regional Master Intelligent Transportation System (ITS) plan and the Regional Transportation Improvement Program (TIP), per federal planning guidelines.

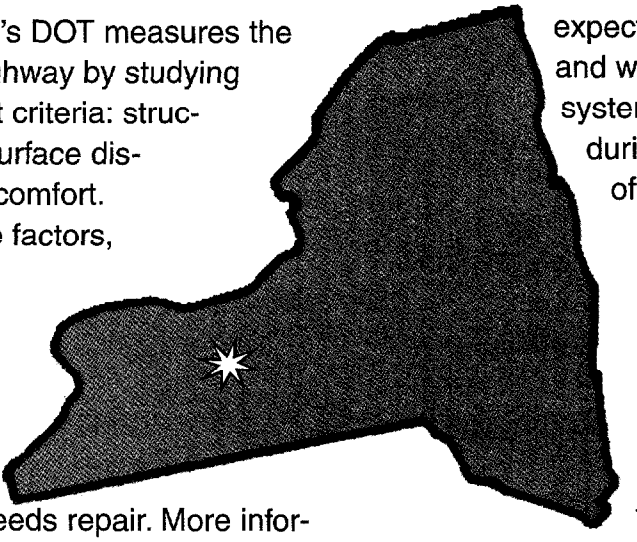
Among its accomplishments, Monroe County has introduced a bus system that enables welfare recipients to work in outlying areas not previously accessible by mass transit. In a community where job growth often concentrates in the suburbs or malls on the city periphery, poorer families or individuals without personal transportation are disadvantaged. Rochester's Regional Transportation Authority has addressed this need by implementing a morning city-to-suburb route — similar to a reverse commute — that uses excess road space for greater efficiency.

In stressing the importance of using resources and personnel in a trained systematic way, Dolan recanted an early 90's Federal Highway Administration audit of traffic control systems. The audit showed that many jurisdictions did not maintain performance standards on their traffic signal systems, underscoring that poor signal and freeway systems can rapidly lead to operational degradation.

In addition to ensuring Monroe County's employees are both technically proficient and generally knowledgeable, Dolan believes strongly in performance measurement. His department is progressing with plans to measure many key indica-

tors including travel times, stops, delays, congestion and accidents. As part of the overall Regional ITS plan, Dolan wants to link this traffic information to a GIS, which will enable Monroe County and the New York State Department of Transportation (NYS DOT) to track system component performance, location by location, while monitoring the regional system as a whole.

Monroe County's DOT measures the quality of its highway by studying three pavement criteria: structural integrity, surface distress, and ride comfort. Based on these factors, Dolan has assessed that 33 percent of his county's roadway pavement remains deficient and needs repair. More information like this helps Dolan to prioritize the deployment of resources efficiently and cost effectively countywide.



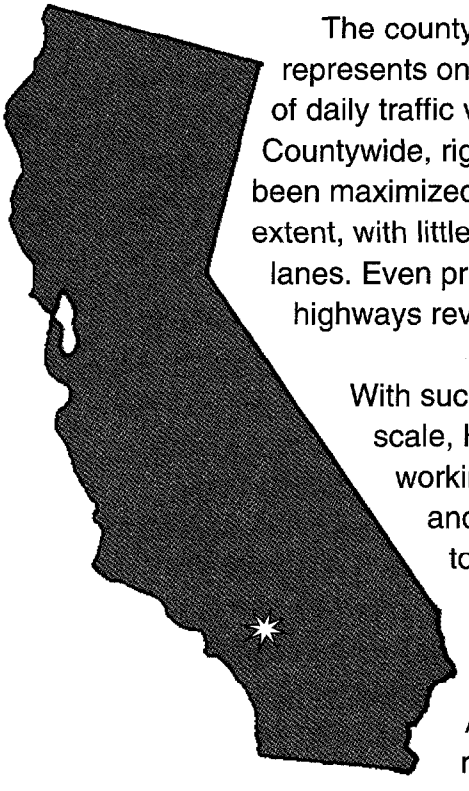
At the center of Monroe County, Rochester, New York, is home to giant corporations Bausch and Lomb, Xerox, and Kodak. Bad road conditions can delay shipments and interfere with orders, weakening Rochester's overall economic power. To lessen the impact of poor road conditions, Monroe County and the New York State DOT have begun to implement a freeway management system on a four-mile section of Rochester's Route 104.

As the first of multiple projects planned for all the region's freeways, the new management system will include variable message signs, camera surveillance, and road weather information. Dolan expects this up-to-date road and weather information system to be of high value during Rochester's long, often hard winters.

During phase one implementation, the system will provide trucking concerns and other large companies access to the traffic data, enabling them to plan shipments. Additionally, a joint operations center (slated for construction in 2000) will employ staff to coordinate traffic, highway management, and maintenance. The DOTs of Monroe County and NYS, along with NYS Police and local airport operations will share use of the center.

Los Angeles County, California

At the other end of the country — in far different weather — John Hill, Transportation Program Manager for the Los Angeles County Department of Public Works faces many problems similar to those of Monroe County. Congestion on freeways and arterials of Los Angeles is legendary.



The county's public transit represents only a minor portion of daily traffic volume. Countywide, rights-of-way have been maximized to a large extent, with little room for new lanes. Even privately funded highways reveal their limits.

With such challenges of scale, Hill has been working on a county and regional project to improve signal system synchronization. The sprawl of Los Angeles County reaches 4,083 square miles, with 9.2 million residents in 88 cities and unincorporated islands. Only 10 of these cities exceed populations of 100,000, with the city of Los Angeles alone encompassing 469 square miles and housing 3.6 million residents.

Few of these cities have advanced traffic management systems, with the most sophisticated being the Automated Traffic Surveillance and Control (ATSAC) system operated by the City of Los Angeles Department of Transportation (LADOT). Operating 2,500 of the city's 4,300 traffic signals, ATSAC monitors delays at key intersections on a second-by-second basis and automatically implements timing modifications in response to fluctuating traffic flows. Along critical freeway corridors, the city and Caltrans (California's roadway network operator) share traffic information and coordinate traffic management plans.

Other cities within the county lack in-house technical skills needed to implement advanced traffic management systems and individually cannot finance control centers. As a result, the Metropolitan Transportation Authority (LA-MTA) and the County of Los Angeles Department of Public Works have begun the daunting task of encouraging groups of cities in each of the county's regional areas to coordinate or consolidate signal systems. Through this cooperation, cities within a regional area would have a common operating center with seamless signal systems at city limits. Under this scenario, outside expertise would design and implement a turn-key system and pooled funds can enable the buildout of a traffic management center. To encourage coordination, the plan calls for grant funding.

LA-MTA has proposed paying for the bulk of the capital work, with goals of having buses move faster through the county's arterials and local streets. As of May 2000, most of the jurisdictions had not yet reached an agreement on relative shares.

The question of 'who pays O&M costs' links directly to 'who benefits from O&M.' Localities from across the country face this dilemma. It's the essence of the time-honored problem between individual desires and societal limits, perhaps best captured in the words of a former British Minister of Transport:

"Your car is a stinking, congesting, polluting, dangerous threat to life, limb, and my schedule. Just the same, it should be known that my car is an indispensable extension of myself, my guarantor of mobility, and connectedness, the very expression of my freedom."

All individuals want the benefits of an extensive, well-maintained transportation system. Even those house-bound, too young to drive, or without the need to travel by car or other means, benefit from a transportation system that enables access, movement of goods, emergency response, and potentially national defense. Simultaneously, however, having to share transportation resources has become despicable and slows individual progress.

Consequently, accountability becomes misplaced with both cultural and attitudinal reluctance to bear the costs of congestion.

Devising a regional strategy for enhanced synchronized signals can also be problematic. When motorists must divert from crowded freeways onto a given city's arterial routes and signal systems must accommodate them, the benefits accrue to the off-freeway driver and the employment center communities; the city assumes the financial burden. This accommodation often occurs at the expense of local citizens who must endure longer queues to enter and exit their schools, developments, and shopping strips. Whenever local streets become detours for faster moving long-distance drivers, they become transportation system adjuncts, compromising local safety and quality of life.

Naturally, local businesses desire higher levels of traffic to attract business volume. As Hill explained, signal engineers become caught between, "...mothers with strollers on sidewalks and chambers of commerce seeking outside shoppers and sales tax revenue."

Hill said his county has been working to enhance its global competitiveness by improving freight movement through the Alameda Corridor. Ports of Los Angeles County link to the rest of the country by rail lines — some still at grade. The conflict between long, slow-moving, at-grade,

freight trains and the needs of motorists is severe, as Los Angeles remains a major hub for the import and export of manufactured goods, petroleum, grains and ores, and more.

The Alameda project endeavors to dig a trough that lowers the rail line below ground, eliminating grade crossings. Technically, portions of the project do not fall under O&M because they involve expensive, large-scale construction. However, the project largely qualifies as O&M because its capital work is designed to rationalize the inefficiencies of the system as built. Like many communities in the United States, Los Angeles's transportation system has numerous unplanned aspects and O&M seeks to optimize available resources and geography.

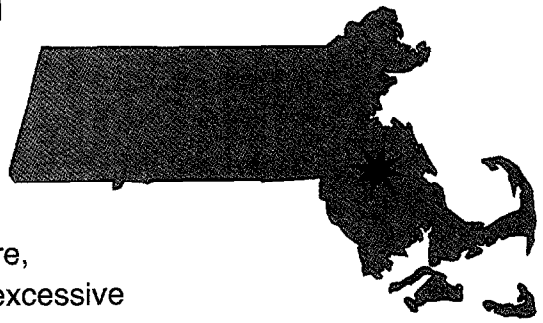
According to Hill, the Alameda project is relevant for three reasons. First, it's tangible — citizens can view its success and utility, while elected officials reference it as a sign of Los Angeles's current and future economic importance. Second, the Alameda project alleviates congestion from a distinctly awkward source — the unexpected delay to motorists because of a lengthy freight train's passage. Third, the project can help drastically reduce the number of trucks on Los Angeles's roadways. Note that O&M philosophy favors goods transported on rail rather than truck when possible.

Yet not all of Los Angeles's O&M efforts reside wholly at the public level. Hill said that the El Segundo Employers' Association has begun work on an intelligent transportation demonstration located south of the Los Angeles International Airport. This project makes use of traffic signal systems, traffic and transit management systems, monitoring centers, emergency management, and real-time traveler information.

Boston, Massachusetts

With its historic spirit, Massachusetts does not shy away large, complex perhaps problematic endeavors. The Massachusetts officials who consulted on this white paper contributed a number of ideas that are seminal to effective O&M across the United States.

Para Jayasinghe, City Engineer for Boston's Department of Public Works said that states should show a dedicated funding source for maintenance to legitimize receiving federal capital money. In addressing the life cycle of capital program, Jayasinghe said that inadequate maintenance leads to premature system failure, litigation expense and excessive expenditures for early replacement. Clearly, Jayasinghe believes that maintenance requires long-term strategic planning.



Tom Kadzis agreed. As Director of Technology Development for the city of Boston, he argued for increased federal awareness of the effects that local government operations have upon Boston's transportation system.

Respectfully, Kadzis said that feds should be concerned that few, large-city DOTs maintain relational database management systems (RDBMSs) of transportation assets and regulations. Efforts to convert flat-file record systems into RDBMSs remain universally hampered by resource constraints and complicated, high-volume field data collection tasks. These factors are exacerbated by the admittedly "unexciting" profile of traffic assets and regulations.

According to Kadzis, the federal government is in the best position to improve the use of current database technology for O&M by sponsoring projects that demonstrate local government asset inventory and regulation management, which localities nationwide can replicate for better cost effectiveness.

Finally, Kadzis identified a number of different O&M challenges and their potential solutions:

— Parking management, asset inventories, and traffic regulations, everyday transportation responsibilities that directly affect quality of life and economic well-being can improve through the use of modern management tools, such as geographic information systems and Intelligent Transportation Systems.

— Local governments operate functionally obsolete asset inventory and regulation information systems, resulting in higher labor costs, wasted efforts, and inefficient use of already-limited budgets.

— Traffic initiatives are hampered by excessive field investigations that restrict organizational capacity. With modern database scheduling, routing and inspection can be far more cost-effective.

— Improved management of regulatory assets, which designate vehicle-turning movements, stopping locations, travel directions, and parking control, can enhance public safety, traffic flow, and parking turnover.

To improve asset inventory and regulation management, Boston has employed emerging technologies to become the first city in the world to complete a comprehensive block-by-block, citywide intelligent video survey. Now city transportation employees can visually inspect any location in the city from a desktop computer and maintain a video database of signs, striping, lights, poles, and curbs throughout the city (see photos). This computer-based archive is a key component for a comprehensive asset management system. The city plans to extend the value of the database by converting current data into tabular data for linking with a GIS.

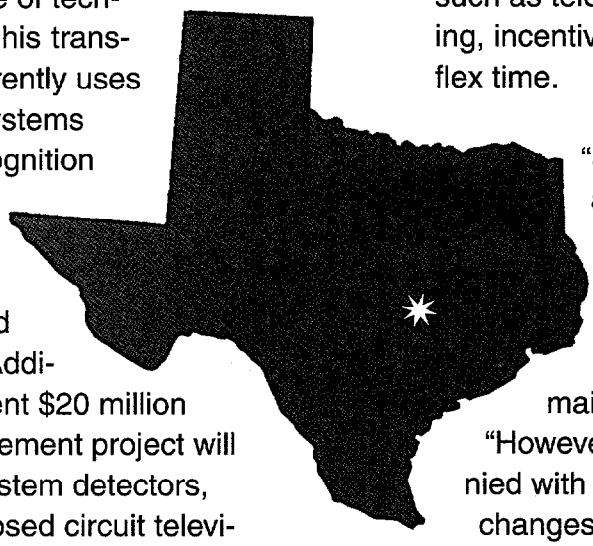
Austin, Texas

In fast-paced Austin, Texas, rapid growth has been both a blessing and challenge to this city, with recent public polls indicating transportation as the number one issue affecting upcoming local elections. For David Gerard, Manager of the Transportation Division of the Public Works Department for Austin, these polls affirm the broadening spotlight on his streets and arterials.

Gerard said he is caught between motorists who want shorter, less congested trips and residents who want calmer traffic and fewer large new road projects. While his department implements management solutions such as more left turn lanes, turn prohibitions, reversible lanes and on-street parking reduction, it's also experimenting with the conversion of one-way streets to safer, slower two-way streets and building bike routes. In all, Austin aspires to have 15 percent to 20 percent

of its roads dedicated to pedestrians and bike trips (currently, the city has less than 2 percent).

Gerard's management plans largely center around the use of technology. For example, his transportation division currently uses Global Positioning Systems (GPS) and voice recognition technology to inventory signs, sidewalks, street condition, parking and other infrastructure. Additionally, Austin's current $20 million signal system improvement project will upgrade or deploy system detectors, traffic signals, and closed circuit television linked through fiber optic cable. By linking 1,500 to 2,000 locations, this integrated solution will enable Austin to monitor and detect speed, flow, incidents, and other key performance and emergency data. Through these efforts, the city expects to improve both congestion and safety.



For the future, Austin is (tentatively) considering the implementation of demand management techniques such as telecommuting, peak shifting, incentives for transit use, and flex time.

"Smart growth, if defined as infill, increased density, reduced sprawl can potentially reduce the inventory such as miles of streets requiring maintenance," said Gerard. "However, if it is not accompanied with trip reduction/mode changes, etc., it can place an added burden on existing facilities."

Miami-Dade County, Florida

After decades of Florida's surging population increases, job creation, and urban sprawl, Miami-Dade County planners and other decision makers are well-seasoned in challenges posed by rapid growth. At the Miami-Dade County Metropolitan Planning Organization (MPO), Jose-Luis Mesa said, "Community leaders are demanding nowadays more accountability from the transportation agencies in the face of shrinking budgets and increasing urban travel congestion."

Mesa, the visionary head of Miami's MPO, believes the federal government should place greater emphasis on O&M by establishing standards for technological applications and fostering pilot programs that link technology to operations. Furthermore, as state DOTs ironically resist new technologies but inevitably receive the lion's share of federal funding, localities remain at a disadvantage for funds. In light of this, Mesa believes the federal government should enable cooperation among city, regional, state, and federal agencies.

Mesa said he also favors a strong federal role in the deployment of traveler information and in the encouragement of creative use of existing highway infrastructure such as contraflow, reversible lanes, markings, and segregation of traffic. In Mesa's MPO, intelligent transportation systems are key to an operational framework, which integrates multiple loading, signal timing, and demand management (daily, seasonal, and for special events).

The Miami area is an important crossroads for tourists, trucking, and ship and rail-borne freight. Miami International Airport (MIA) serves as a major hub that links South America to Europe and much of North America. To address the region's sizable mobility challenge, the city has begun work on a $2 billion national demonstration project at MIA that incorporates key operational and management approaches.

For example, the MIA transportation demonstration provides an intermodal hub for air, transit, highway, and cruise ship passengers as well as commuter and regional uses. People movers connecting new facilities to old ones are key parts of making this intermodal center useful for tourists with baggage and for the elderly. For greater convenience of travelers, foreign language signage is also used. Miami, at the crossroads of cultures,

captures a key cultural dynamic. Travelers across all modes want comfort and convenience. Travelers can be lured out of their cars but expect a reasonable level of comfort, safety, and efficiency in their use of other modes. In response, modern intermodal management supports these needs.

The Miami area has also introduced SunPass, an electronic toll collection (ETC) system located on Route 836 and the Florida Turnpike. SunPass has become popular with motorists for its convenience, enabling motorists to save travel time. The public views the program as a tangible improvement provided by government.

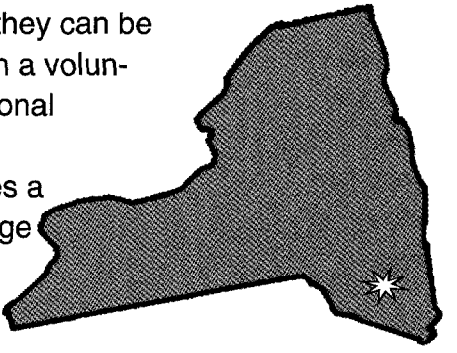
New York City, New York

Like Miami's SunPass, New York City's EZPass ETC system combines several O&M components. Conveniently, the system provides an electronic transponder that covers facilities run by the Port Authority of New York and New Jersey, the Metropolitan Transportation Authority, the New York State Thruway and soon the New Jersey Turnpike. As a result, EZPass simplifies a multijurisdictional nightmare for motorists and truck drivers in the nation's most heavily tolled corridors. EZPass provides a clear example of operations technology overcoming geographical and governmental fragmentation.

The New York City area has also achieved a measure of success by using O&M technology to coordinate emergency response, special events, and construction- and weather-related information. TRANSCOM, the multistate, multiagency clearinghouse has been designed to link the transportation and public safety agencies of three states (New York, New Jersey, and Connecticut) to coordinate information flow and incident response.

Regionwide, more than 250 variable message signs are deployed. Although local agencies operate and

control the signs, they can be made available, on a voluntary basis, for regional needs. Let's say a local agency closes a Hudson River bridge because of icy conditions. Motorists, more than



100 miles north of Hartford, Connecticut, or 80 miles south of Philadelphia, Pennsylvania can receive notifications of the bridge closure and receive suggestions for alternate routes. All this stems from a central TMC with an O&M focus.

The tri-state, New York metropolitan area has established a mini-TMC (TRANSCOM) when the region's population base stabilized. All 14 members of TRANSCOM have agreed to share costs for the project, based on criteria specifying benefits to each member's region.

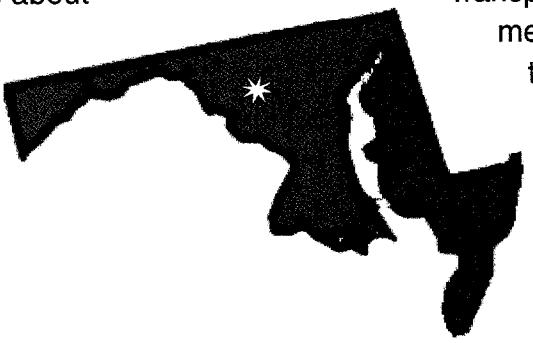
Montgomery County, Maryland

Protecting a jurisdiction from traffic congestion sometimes requires friends in the local budget office. However, Montgomery County's budget analysts don't always appreciate the long-term benefits of intelligent transportation systems, according to Emil Wolanin, ATMS program manager. "Too often, their main interest is the operating side impact of capital expenditures or the immediate savings they can take from operating changes," said Wolanin. "We need to work with the OMB types to open their eyes to regional, systematic considerations beyond the numbers."

Wolanin knows that transportation extends far beyond number-crunching, providing safety, enabling business and economic development. Transportation

also provides a venue for regional and interagency coordination, as well as providing public mobility. When transportation is not working as expected, it acts as a gauge to measure public dissatisfaction.

Yet for all Wolanin knows about the underlying importance of transportation, he adeptly uses numbers to make his case. Each year, the Montgomery County Department of Public Works and Transportation (DPW) issues a report on the State of the Transportation Infrastructure. Through this document, the county intends to provide a framework for the discussion of budgets associated with the maintenance of infrastructure.



This yearly document graphically illustrates annual requirements, actual budget, and predicted backlog (if any) for 15 road, traffic, and parking services provided by the county. Multicolored charts visually capture that huge backlogs, in service after service, will occur if the necessary requirements are not provided. Complementary to these charts, pictures of failed roads, gutters, and bridges are positioned next to those of completed road work. The report also furnishes bullet points, indicating that in order to buy out the backlog, the county must allocate $25.4 million over the next six years to repair 58 signals.

Signal maintenance and replacement is an essential part of the county's initiative to integrate multiple technologies into an Advanced Transportation Management System (ATMS) that uses aerial surveillance, automated signs, adaptive traffic signals, video surveillance, and bus priority automated vehicle location. At its heart, a Transportation Management Center (TMC) communicates with all these components in addition to radio, Internet, kiosks, television, radio, and emergency services. Linking the sources of traffic information to the multiple means for dissemination enables the TMC to respond to changes in traffic volume or flow. Unlike many regional TMCs that change traffic timing several times a day, Montgomery County may change its signal timing 25 to 30 times per day to maintain optimal traffic flow. The flexibility to respond immediately to changing traffic conditions is a critical component of ATMS.

The ATMS has six components, which all use different measures of

effectiveness. For example, the incident management component has three effectiveness measures of incident clearance time, travel times, and vehicle delays (each measure is further assigned a goal for potential improvement). Through the use of ATMS components, the county would like to decrease vehicle delay due to incidents by 300,000 hours per years. With such reductions, the public benefits from improved air quality, faster travel time, and better fuel economy.

Montgomery County is progressing with a project that will place electronic signs at bus stops to alert passengers of the bus schedule and the time until arrival of the next bus. Such applications can greatly improve the perceived quality of the transit experience, helping to increase the likelihood that drivers will opt to change modes.

Wolanin is proud of Montgomery County's ATMS. "It is the integration of various technologies that makes sense of the national architecture to the local user and the local elected officials," said Wolanin. "It's what you do with it."

County elected officials are well aware that vehicle miles traveled on Montgomery County's roads have been steadily rising and projected to rise at least through 2010. In recent polls, transportation and traffic congestion have found their way to the top of the list of concerns for county residents. Suburban lifestyle, in Montgomery County as elsewhere, is predicated on mobility on demand. Wolanin knows that he bears some of the responsibility for this occurrence.

Montgomery County's success can be attributed to a feedback loop process that centers on clearly delineated goals associated with measures of effectiveness. After having deployed a great deal of technology over a 20-year period, the county derives benefits most from having a clear purpose that both citizens and local politicians understand. To the technocrat, the mission to maintain the transportation system must be to ensure and enhance mobility through policy, technology, and daily operations. To the TMC operator, it means the application of different, incoming data to adapt the outgoing messages so that users — whether individuals, transit operators or emergency service providers — can make intelligent choices. In turn, the user achieves mobility that meets or exceeds expectations. Such an informed user becomes a confident voter. To the elected official this means DPW's budget requests are more than just numbers. An effectively designed plan links maintenance, operations, technology, and results.

De-Centralizing O & M

If coordinated, centralized governmental O&M initiatives make transportation systems more effective, then what happens when motorists have the means to make intelligent transportation choices?

With the advent of competent and timely, traffic information providers, more motorists will have access to useful information for travel. Some may choose another mode, perhaps public transportation and others may opt for self-imposed flextime that allow them to avoid congestion by varying departure times from home or office. For others, reliable traffic information will lead to the use of alternate routes. But for those who lack alternate routes or must adhere to rigid work schedules, better information can simply provide the solace of being informed.

Today, motorists receive traffic information in a variety of ways. First, drivers obtain traffic reports via television or print and hear them on a car radio while en route. Motorists can also use the Internet to obtain traffic data, with some Web sites offering advanced functions for summarizing traffic information, highlighting urgent data, and displaying specific data on electronic maps.

Wireless telephones and beepers have also enabled the dissemination of traffic information. Numerous services now offer up-to-the-minute traffic reports and some offer a custom features for enabling subscribers to receive updated traffic information at specified times. Motorists simply indicate their normal routes, receiving beeps or updates only when conditions on those routes change.

As technology advances, soon the average person's car will function as a traveling, remote data station that can send and receive information through on-board computers. Currently available with some luxury and rental autos, this technology offers motorists the use of navigation applications such as computerized maps, route displays, and routing information.

In the future, a vehicle's on-board computer will link directly to different sources for traffic information services, enabling motorists to receive current and accurate traffic information while in transit. Through the ability to view current data in an easy-to-understand electronic map, motorists can rapidly obtain alternate modes, route information, and routing assistance. Some services promise to give drivers intelligent devices that help them decide on a route. For example, a driver may one day have the ability to enter a sequence for "LIEx20" into a cellular phone to find out whether the Long

Island Expressway in the vicinity of Exit 20 flows freely.

The motorist's use of customized traffic information is a result of an evolutionary O&M process. Years of technology deployments by state and local governments have enabled the support of new data services. Decentralizing the process — provisioning useful information to motorists — enables them to make important travel decisions.

Enlightened decision makers understand the power of distributing information to constituents. Consequently, in jurisdictions throughout the United States, localities are working to improve all aspects of traffic information. Data collection, synthesis, analysis, storage, and dissemination of travel information are being improved, often in conjunction with private corporations that can provide comprehensive services for marketing, consumer outreach, and consumer communications technology.

Public policy goals advance when consumers benefit from better transportation information. Travel time improves, for example, when a driver opts off a congested road by shifting modes, flexes out of peak time, or uses a less crowded alternate route. For each driver who learns in advance of an incident or a special event and steers clear of it, others also benefit from faster travel time. Furthermore, public safety improves when there are fewer intervening vehicles on the road and emergency vehicles can reach incidents more rapidly.

Intelligent parking management has a similar beneficial effect. The sooner drivers know where they can park, they spend less time circling congested roadways or driving through already-filled parking garages. Using technology and information to guide motorists away from critical congested areas or toward available space benefits everyone. There is also an economic development benefit.

Finally, some aspects of operational technology serve transportation policy and environmental justice goals. To improve speeds on the city bus system, the Los Angeles program uses transponders and signal preemption which gives riders greater incentive to use public transit and gives public transit a valuable advantage over traditional private auto travel. In parallel, inner city bus users gain travel time advantage over the suburban automobiles that fill the inner city streets, polluting neighborhoods, and diminishing travel speeds for local residents.

Performance Measurement

In San Jose, California, Jim Helmer, Deputy Director of the Street and Traffic Department, wrestles with traffic flow, safety, and budget limitations in his fast-growing Silicon Valley city. Like Montgomery County, Maryland, San Jose has a suburban character and the mobility expectations that go with it. San Jose, long recognized for advanced traffic management programs that maximize capacity of existing systems, is forming regional partnerships with transit providers, parking operators, and Caltrans to better integrate agency efforts. To maximize use of facilities and enhance quality, timeliness, and accuracy for travelers, San Jose and other service providers must improve O&M.

San Jose realizes that strong partnerships are needed to progress with subregional solutions that may not be significant at the state level. San Jose and other cities must strategize investments in transportation solutions to support measurable benefits in time, safety, convenience or an improved environment.

To meet this challenge, San Jose has designed a program named "Investing in Results." Because of a civic culture that supports the measurement, tracking, and action of government performance, San Jose's elected officials and administration understand the value of using technology to link local government services to performance. The city has established broad qualitative measures to evaluate transportation performance with goals to provide:

— *Viable choice of travel modes*
— *Convenient commute to workplace*
— *Efficient access to airport, downtown, shopping, and entertainment*
— *Minimal adverse affects*

In order to refine measured performance, the program incorporates these quantitative indicators:

— *Percentage of transportation usage by mode*
— *Percentage of public rating public transit service as convenient*
— *Percentage of city street intersections with acceptable level of service at peak commute / shopping/ event times*
— *Percent major commute routes at or below acceptable travel time*
— *Comparison of local accident rate to other agencies*
— *Percentage of neighborhoods rating adverse traffic impacts as minimal*
— *Days air quality standards not met (per year)*

San Jose's program also calls for performance measures, including:

Quality

— *Percentage of roadway infrastructure completed and percentage in good condition*
— *Percentage of bicycle infrastruc-*

ture completed and percentage in good condition
— *Percentage of pedestrian infrastructure completed and percentage in good condition*

Cycle Time

— *Percentage of programmed capital improvements completed on time*
— *Percentage of traffic complaints handled timely*

Customer Satisfaction (under development)

— *Percentage of users rating facilities as good or excellent for safety, accessibility, condition, and overall by type (roadways, bicycle, pedestrian)*
— *Percentage of commuters rating commute as acceptable in terms of route and time*
— *Percentage of patrons rating access as good or excellent in terms of time, ease and parking*
— *Percentage of businesses rating goods delivery as good or excellent in terms of time, ease and parking*

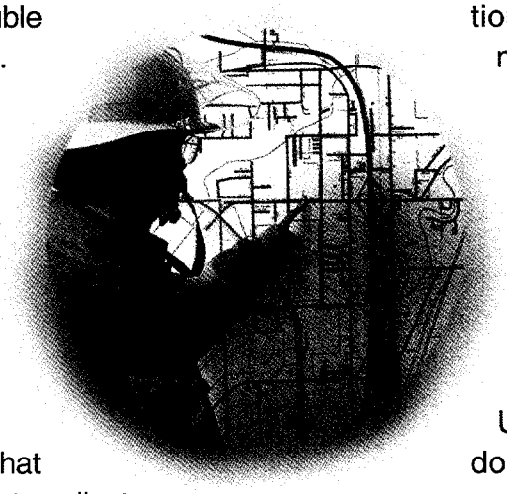
Helmer and other San Jose program managers report quarterly on performance relative to these indicators. According to Helmer, the effectiveness of the city's extensive, detailed tracking has been nothing short of fabulous. "I get the quantitative data to go with my qualitative sense," he said. "It identifies underperforming activities." In reviews, discussion focuses on the variance from expected performance, good and bad. Helmer cautions though, when setting up measurement systems, they must be meaningful, sustainable and useful.

Montgomery County, Maryland, also uses quantitative performance measures. The county established, for example, a goal of a seven-year cycle for residential road resurfacing that involves tracking the number of lane miles resurfaced and their resultant expenditures. From these figures, the county can assess its performance in terms of meeting the desired replacement cycle and associated annual costs. Tracking the quality goal (cycle time) and the efficiency measure (cost) simultaneously enables county leaders to understand key operations.

Not all jurisdictions granularly track department performance. Some set goals and establish measures but neglect to follow up by tracking results; others don't establish goals or measures. Worse, many jurisdictions measure performance only for governmental interpretation.

Two major schools of thought prevail among transportation professionals. One is that performance measurement will yield tangible benefits — measure it and the results will come. Others express a view that performance measurement automatically equates to political accountability.

The greatest value of performance measurement lies in its applications. Culling and processing voluminous data to generate reports that go unread by decision makers is expensive and fruitless. Decision makers must read and understand performance measurement information, then act or seek action on them. Additionally, poor results from performance measurement should not automatically qualify for a program's budget cuts; often a program in trouble needs more resources. Similarly, a program showing solid results does not naturally indicate use of excessive resources.



Doug Wiersig, Chair, PTI's Urban Consortium Transportation Task Force, asked, "What is politically acceptable to collect and functionally useful to know that can serve as a basis for resource allocation?" Each jurisdiction has a different answer and willingness to address this question.

As the Federal Highway Administration seeks to expand its core mission to include operating the system, "actively managing performance safely and efficiently and in harmony with the human and natural environments," it must develop useful performance benchmarks. Advanced use of statistical performance measurement is a fundamental component of an O&M culture. While harmony is a qualitative indicator, safety and efficiency are mostly quantitative. If the Federal Highway Administration is to delve deeply into operations or management, it must embrace performance measurement in terms of both process and results. In doing so, the Federal Highway Administration must heed an admonition from transportation officials throughout the United States: one size does not fit all.

Technology vs. Operations

Many jurisdictions have achieved success in marrying new technologies to ongoing operational problems or goals. However, technology can also threaten operations in several ways. First, new technologies are expensive, often cannibalizing funds critical to maintenance, without providing concomitant cost savings. Second, technologically-driven improvements often do not yield immediate return on investment. Finally, the public becomes immediately aware of mundane issues such as fallen stop signs, potholes, dangerous curves, and high-speed driving and demands their immediate abatement. Because the resolution of these problems requires simple labor and physical resources, technology can only aid slightly.

Elected Officials

Few observers doubt the relevance of O&M to decision makers, but remain concerned about O&M's relevance for the right reasons, implications, and decisions. As widely noted, many elected officials tend to have limited time perspectives, which makes them susceptible to numerous short-term pressures. These political and very human characteristics contrast with the fundamental nature of traffic engineering that typically creates long-term improvements achieved incrementally.

Politicians tend to address the more sensational and dramatic issues of their constituents. Lacking in glamour, transportation maintenance issues have not kept pace financially, despite vast increases of federal capital funds in 1991 and 1997 to expand infrastructure. As a result, the local burden of operating and maintaining both the original system and subsequent additions will become unsustainable.

System enhancements, whether roadway capacity or technology, and even increased use of public transit all impose further demands on O&M for which exist few additional funding sources. An elected official who basked in the glow of a ribbon cutting will rarely return to that site six months later to call for the funding of curb and sidewalk repair, street sign and light pole replacement, striping, paving, signal maintenance and the other daily labor

intensive essentials that are the gist of a transportation agency's job.

Many transportation officials have observed that elected officials are more intensively involved in transportation activities with proposed new developments. At these exciting, revenue generating, and job creating junctures, politicians across the nation face the challenge of balancing traffic flows with signal timings to determine how much new volume can be shoehorned within the existing volume. Jim Jackson, a Dallas County commissioner, refers to highways as economic development tools. Too often, these driving-intensive developments are approved with minimal mitigation imposed on developers. Far too often, new traffic volumes and infrastructure are created without allocations for O&M.

Federal Highway Administration's Role

Most transportation observers consulted in this study expressed a reluctance to further federal government involvement in local transportation affairs, largely due to an onslaught of new regulations accompanying any new federal assistance. Many jurisdictions inferred a preference for the distribution of federal largesse to states, provided localities would benefit proportionately. The contributors to this study expressed general agreement in a number of areas:

Regional Transportation Management Centers

There is wide agreement on both the regional and local importance of TMCs. There is also widespread agreement that federal involvement would be helpful to address the jurisdictional and burden-sharing issues faced by regional TMCs.

Technology Development and Standardization

Few localities, if any, can afford the expense of technology research and development (R&D). Few localities want to pay a private company for the full cost of R&D associated with a given community's technology initiatives. Federally-backed technology development can reduce unit costs to localities by creating a national market for new technolo-

gies. Similarly, federal efforts could help to standardize and implement architecture, deployment, operating procedures, and ongoing maintenance.

Local Beta Test Sites

Because cities and counties are live laboratories for transportation, they're most likely to contribute innovative transportation technology ideas. Prototype deployments should be tested throughout the country in response to ideas proposed by cities/counties with promising innovations. The Federal Highway Administration should sponsor such efforts and share results with other communities facing similar challenges.

Today's current national research program, which includes the Federal Highway Administration research ITS program, NCHRP, NCHRP IDEA, TCRP, Transit-IDEA, SHRP, and other programs largely excludes significant involvement from the nation's cities and counties. With the exception of transit, most past research occurred at the state level.

Because much of O & M resides at the local level, future research efforts must include direct relationships with local governments. The PTI Urban Consortium could provide such a research forum.

Member jurisdictions of the Urban Consortium are among the most technologically advanced and innovative local governments around the country. These cities and counties can assess O&M need, develop solutions, and collaborate across functional areas such as law enforcement, telecommunications and other emergency service agencies.

Future Federal Legislation and Funding

The Urban Consortium would like to work proactively with the Federal Highway Administration to develop proposed language for future transportation legislation, in line with mutual needs and objectives.

The Urban Consortium Transportation Task Force has also recommended that PTI staff work closely with the National League of Cities (NLC) and National Association of Counties (NACO) to develop a unified position on funding and other important O&M management issues for local governments. APWA, ICMA, ITE, STPP, NACTO, NACE were also recommended as organizations to ally with on this initiative.

Many of the issues that need to be considered would benefit greatly from the local perspective. For example, local

governments with populations over 200,000 have an opportunity for a sub-allocation that can increase funding at the local level. Also recommended was a statement in the proposed legislation to relieve states' liability of passing funding to the locals. Preliminary work in this area should also examine the certification and exclusion processes for federally funded local agencies.

Performance Measurement

A need exists to establish better local indicators, such as those provided in ISTEA's metropolitan planning process, which requires each metropolitan planning organization (MPO) to have a federal plan consistent with a state level plan. In this way, communities establish goals according to their needs, using federal planning rules as guidelines, not instructions. Furthermore, performance measurement helps communities respond intelligently to specific traffic issues for the attainment of improved economic development, air quality, mobility, travel time, and the like.
To strengthen the bond between asset management and performance measurement, localities should:

— *Determine assets*
— *Incorporate General Accounting Standards Board (GASB34) regulations*
— *Request federal funding to meet the GASB34 regulations*

The FHWA and federal legislation should programmatically encourage communities to address these issues but only according to local customs and needs.

Conclusion

"At the heart and soul of the enterprise you need intelligence, engineering, and enforcement," said Sam Schwartz, a transportation consultant and former First Deputy Transportation Commissioner, New York City. Intelligence guides the process and establishes the rules of the game; engineering creates a safe playing field and deploys the technology; and enforcement ensures safety and observance of rules. Through intelligence, engineering, and enforcement, technology, resources and performance measures are most effective.

The user of O&M determines its value. For some, O&M is a strict measurement of potholes filled in. For others, O&M provides an indicator for — all other things being equal — travel time declining. For others, O&M enables properly maintained locales and a system of integrated places. Wise elected officials and other decision makers understand the value of O&M to achieve both ends.

Local government can view transportation system improvements as tangible signs that the system affectively serves the public. Intermodal centers and efficient mobility hubs can stimulate economic growth. The effective application of technology can enable efficiency and mobility to the American ideal of freedom of movement.

The PTI UC Transportation Task Force has identified these O&M issues for local governments to address in future federal legislation or regulation:

— *maintenance funding*
— *interagency coordination*
— *institutional resistance*
— *technical training*
— *retention*
— *convincing elected officials of O&M's benefits*

These city and county transportation leaders want O&M concerns to be adequately funded from dedicated sources, addressed at a regional level, and more highly ranked within future transportation bills.

As local governments realize the tangible and practical benefits of O&M to tax payers, traffic engineers, and planners, elected officials will have a greater propensity toward supporting and seeking additional resources for O&M. With benefits such as equitable funding among cities and counties, the building of TMCs, and 'invisible' technical improvements such as signal synchronization, O&M can increase in value, attracting ongoing financial support and providing the intelligence in the intelligent transportation system. ▲

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