



+ Building The Intelligent Transportation Infrastructure +

Taking Transportation into the 21st Century

To future generations of transportation planners and policymakers, the 1990s will be viewed as a decade of transition. In the first five years of this decade, nearly everything about how the United States meets its transportation needs, from how traffic is managed to how construction projects are financed, has been scrutinized and reconsidered. Necessity is the driving force of this change. At a time when revenues at the federal and state levels are declining and budgets are being cut, ever growing numbers of vehicles are squeezing onto an aging infrastructure.

Unlike the 1950s when the U.S. Department of Transportation began construction of the Interstate highway system and revolutionized the movement of people and goods, the United States cannot build itself out of this problem into a new era of prosperity. In many urban and suburban areas, highways are already built to the limits of existing rights of way. Over the past decade, the number of vehicles using the Interstate system has risen by more than 30 percent, and demand is expected to grow by another 50 percent in the next generation. We need to find solutions which utilize roadways more efficiently.

According to the latest "Estimate of Urban Roadway Congestion" survey published by the Federal Highway Administration, from 1982 to 1990, congestion in San Diego grew by 56 percent. During the same period, congestion in Atlanta, Dallas, Minneapolis, Seattle, Los Angeles and Washington, D.C. grew by 25 to 30 percent. The same survey found that Los Angeles would have to build 197 miles of freeway lanes and 468 miles of new arterial lanes annually to maintain 1990 levels of congestion. New York City would have to build 458 miles of new freeway and arterial lanes to maintain 1990 congestion levels. And the problem has grown worse over the past five years.

Americans lost more than 2 billion hours to traffic gridlock last year, a loss which translates into higher costs of doing business, longer waits for emergency vehicles at accident sites, time spent sitting in traffic instead of being with family, more pollution and a generally lower quality of life.

The problem of not enough capacity will not go away by itself. Federal studies show that over the past two decades driving patterns have changed considerably: rush hours start earlier in the day and extend later into the evening. Commuters are moving farther and farther from where they work. More workers are commuting from one suburb to another, increasing the number of destinations and goods delivered by trucks. This puts more vehicles on the roads for more hours of the day, thus making it more difficult for transportation planners to create transit alternatives.

The U.S. Congress, the U.S. Department of Transportation, private industry, state legislatures and transportation agencies across the country, along with a growing number of municipalities, have begun to address these issues through the deployment of new



transportation technologies, services and financial tools for funding and accelerating the implementation of badly needed projects.

On January 8, 1996, Secretary of Transportation Federico Pena, at a major policy speech during the Transportation Research Board's Annual Meeting in Washington, D.C., launched an offensive against gridlock with the announcement of Operation Timesaver. The goal of the project, he said, is "to build the Intelligent Transportation Infrastructure (ITI) across the United States within a decade—to save time and lives and improve the quality of life for Americans everywhere." The U.S. Department of Transportation estimates that Americans will save up to 15 percent off their present travel time by building the ITI. The effort will require federal, state and local officials working with the private sector to implement the program,

"Our initial focus will be in metropolitan areas where all that is needed initially is for mayors, county executives and governors to plan smarter and buy smarter," said Secretary Pena "If we are smarter, it is reasonable that we can see the basic components of ITI implemented to serve 50 percent of the U.S. population in the next decade."

Intelligent Transportation Systems (ITS) are the marriage of telecommunications, information and computer technologies with the transportation infrastructure. The concept behind ITS is where the traveling public is provided with up-to-the-minute traffic and transit information in their homes, their automobiles or in their places of work, they will avoid congested roads, choose alternative modes of transportation (such as transit trains and buses) and seek out rideshares. Traffic management personnel who receive real-time information of traffic accidents or incidents can dispatch police, emergency medical services and tow trucks to the scene within moments, adjust street signal patterns to move traffic through the area more quickly and advise motorists in other parts of the city through variable message signs along the roadway, at bus stops and in transit stations and highway advisory radio to reroute around the incident location. Transit operators working with vehicle location technology can pinpoint their buses anywhere along their routes and can make adjustments to help off-schedule vehicles get back on schedule. By integrating traffic signal controls with transit management, flexible signal timing can also speed up the bus trip and improve schedule performance.

The movement of goods carried by commercial vehicles is enhanced in states that have deployed electronic clearance technology that weighs trucks; checks their registration, drivers' licenses and other permits; conducts safety inspections of the truck's operating systems; and provides border clearance as the vehicle rolls past a roadside inspection station at highway speed. Other technologies allow motorists to electronically pay tolls as they drive through toll plazas at highway speed or issue a signal for assistance when their vehicle is involved in a crash or breakdown, particularly in rural areas.

The technologies Secretary Pena is asking state and local officials to consider deploying under Operation Timesaver include:

- Computerized traffic signal control systems.
- Freeway management systems.
- Transit management systems.
- Incident management systems.

- Electronic fare and toll payment systems.
- Regional multi-modal traveler information centers.
- Railroad grade crossing warning systems.
- Emergency management systems.

The emphasis will be on local officials to “buy smarter”-by purchasing equipment that is interoperable across modes and in neighboring jurisdictions. Local officials are also being urged to integrate the ITS technologies and services they presently have in place as well.

A number of states, regional planning organizations and cities already have deployed various ITS technologies and strategies to keep traffic moving. Minnesota Guidestar, the statewide ITS program, has equipped Minneapolis transit buses with automatic vehicle location devices that monitor their whereabouts and allow transit operators to adjust their schedules should they begin to run late. Commuters and other travelers can gather up-to-date traffic information through their computer terminals, roadside message signs, display monitors and kiosks placed in public places. The Genesis System, which transmits transportation information through such common personal communications devices as pagers, was recently introduced by Minnesota Guidestar. In nearby St. Paul, the city’s Incident Management program allows emergency vehicles to change traffic signals as they approach intersections to help speed them to incident sites. This system also provides real-time information on transit schedules and performances.

These innovations have helped Minneapolis increase freeway rush hour traffic speeds by 35 percent and roadway capacity by 22 percent. Accident response rates have been decreased by 20 minutes.

In Houston, the Texas Department of Transportation, Houston Metro, the City of Houston and surrounding Harris County have teamed up to create a fiber optic network of computerized traffic signals, roadway sensors, video cameras, changeable message signs and other incident detection systems to monitor traffic movement. As a result, congestion in the metropolitan area has been reduced since 1984. Eventually 2,800 traffic signals will be computerized to improve overall traffic and bus flow on arterial streets. This system will allow emergency vehicles and transit buses to request that a signal go green so that they can clear the intersection. Commuters can receive real-time transit information via kiosks, telephone or their home computer.

In Seattle, the flow of traffic along the city’s Interstate highways is up almost 20 percent, thanks in large part to an advanced freeway management system. Most surveyed drivers report cutting their travel time in half. In New York City, the Metropolitan Transit Authority estimates that its new electronic fare system will increase annual revenues by \$34 million from merchant fees and revenue floats, \$140 million from unused fare cards and \$49 million from increased ridership. The MTA also expects the new system to cut losses due to fare evaders by \$70 million a year.

Such technology that allows for more efficient usage of existing infrastructure costs as little as 5 percent of what comparable highway construction would cost, said Deputy Transportation Secretary Mortimer Downey in a recent newspaper editorial. The U.S. Department of Transportation estimates that it presently costs \$39 million for every mile of new freeway construction. For the cost of building five to 10 miles of new freeway, which will serve only those citizens along that corridor, the IT1 can be deployed in an

entire metropolitan region serving all the citizens. Many ITS technologies are in the early stages of their deployment and the savings should increase once they mature, he added. Downey explained that the ITS technology that can produce the above results is available today off the shelf.

Until now, ITS has been perceived by the public as an elite, "Star Wars" type of technology with no real applications for today's driver. One of the major thrusts of Operation Timesaver is to bring ITS into the mainstream of transportation policymaking and public perception about transportation, said Secretary Pena. He challenged state and local governments to consider ITS as more than competition for scarce capital improvement funds and see it as a means to increase transportation capacity. For its part, the U.S. Department of Transportation will provide technical assistance, training and general education on how to "plan smarter and buy smarter."

The Secretary's message also signals the beginning of a new relationship between the public and private sectors. While the public sector will bear primary responsibility for building and maintaining the ITI, the private sector will supply many of the products and services that will be key components of the deployment. U.S. DOT will urge state and local governments to seek active partnerships with the private sector, Pena said.

A paradigm shift in transportation was marked with the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, which began to redirect national surface transportation priorities. While seeking to continue long-term federal road, bridge and transit programs, ISTEA called for better planning and management of the nation's transportation program and more efficient and environmentally sensitive use of national multi-modal transportation facilities. The act called for more efficient use of new technology to improve U.S. mobility and the safety of the transportation infrastructure and also to help meet Clean Air Act, Americans with Disabilities Act and other legislated requirements. U.S. DOT has invested nearly \$700 million to develop and test ITS technologies over the past five years. At the same time private industry has invested even more to develop the products and services that will form the backbone of the ITI.

As Jane Garvey, assistant administrator at the Federal Highway Administration, said at a recent conference on state infrastructure banks: ". . . a new order is upon us that is not just about ISTEA. Since the Vietnam War, we've been short of capital funds for transportation. We must find new ways to remedy the problems that we face."

Within the transportation community there is a growing belief that everyone affected by our transportation system must "buy into" the ITI concept. No longer can infrastructure development be implemented from the top down. Instead, new partnerships involving the public sector at all levels, along with private industry and consumers, must work closely together if we are to meet this nation's growing transportation needs with the dwindling financial resources available.

Over the past 40 years, the federal government has dispensed transportation funds through a grant reimbursement program that has compelled states to use a rigid formula of beginning construction projects only when they had the underwriting funds in hand. Over the years, many critical programs sat on the shelf until the required federal and state funds had been accumulated.

Relief from this antiquated funding system came on November 28, 1995, when President Clinton signed the National Highway System (NHS) legislation into law. Within the NHS language are several provisions that allow state and regional planning authorities to explore a number of innovative financing mechanisms including state infrastructure banks and advanced construction (where a company will underwrite needed construction and the state or regional planning authority will reimburse the costs over time). The states also have been granted freedom to use federal funds for debt service on outstanding loans and to make loans to non-toll transportation entities that don't have an apparent dedicated revenue stream. This legislation also permits the states to seek out private sector partners, be they the financial markets, construction firms, manufacturers, telecommunications companies, information providers, etc., and to use their contribution to a project towards the state's match to federal funds. Under the NHS legislation, a state may use up to 10 percent of its annual ISTEA funds to establish or recapitalize a state infrastructure bank.

A realignment of priorities is essential if the United States is to remain competitive in international markets. Although much of what is considered core ITS technology has its genesis in the United States, other countries have made its deployment a high priority. Japan has invested \$2 billion to build 160 state-of-the-art traffic management centers across the country. Also, in Japan there are upwards of 750,000 in-vehicle navigation devices presently being used by motorists throughout the country. In Asia and much of Europe, high technology companies enjoy close working and business relationships with their home governments. According to U.S. DOT estimates as much as \$220 billion will be spent on IT1 technology in the United States over the next 20 years. Much of this business could go to foreign firms with advanced ITS technology and services on the market, if public/private partnerships are not fostered in the United States.

The U.S. DOT estimates that the United States spends about \$1 trillion or one sixth of the U.S. Gross Domestic Product on transportation products and services every year. A 1 percent improvement in the efficiency of this country's transportation system would save the American economy \$100 billion over the next decade. Although there has been little federal support for industry development of technology in the past, the United States must foster public/private partnerships if it is to remain economically competitive in the future.

"In the transportation industry, we have seen U.S. leadership in the aerospace and commercial space sectors challenged by well-organized consortia and countries," says Secretary Pena. We must respond aggressively to these challenges by maintaining an effective balance of applied and basic research even in this fiscally restrained environment."

Operation Timesaver sends a signal to industry that the U.S. Department of Transportation will aggressively support the states' efforts to deploy ITS technology and services, says Secretary Pena. Besides serving in an oversight and development capacity regarding standards, the department will also provide training for state, regional and local transportation officials on the technologies and new innovative financing mechanisms incorporated in the National Highway Systems legislation and will set up an on-line clearinghouse to provide a wide range of ITS information on technical developments and also model legislation language that has been passed in the states.

This should raise local officials' "comfort level," about building the ITI, says Secretary Pena, which, in turn, should fuel development and the maturation of the ITS industry.

This type of support is crucial, says one economist, because it provides the private sector with needed indicators of the long-term viability of the ITS program.

"We have discovered that private industry tends to invest more in research and development when the Federal Government invests more in research and development, said Laura Tyson, assistant to the President for Economic Policy, in a recent interview. "The benefits of this kind of research are widely spread throughout the economy."

"We are investing in our future," says Tyson. "Given the pace of technological change today, investments in the future can very quickly become the source of prosperity in the present."